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ANNUAL REPORT

OF THE

OHIO ACADEMY OF SCIENCE

Forty-seventh Meeting

1937

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THE OHIO ACADEMY OF SCIENCE

Organized 1891 Incorporated 1892
Affiliated with the American Association for the Advancement of Science

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REPORT OF THE FORTY-SEVENTH ANNUAL MEETING OF THE OHIO ACADEMY OF SCIENCE

WILLIAM H. ALEXANDER,
Secretary

Introductory

The Forty-seventh Annual Meeting of the Ohio Academy of Science was held at Columbus on May 13th–15th, 1937, under the joint auspices of the Ohio State and Capital Universities. The attendance was good, the programs were excellent and well attended, and a fine spirit prevailed generally.

The meetings of the Academy proper began on Friday morning, May 14, and were held in the auditorium of Mees Hall, Capital University. These meetings were given over, first, to business, and second, to a general scientific session. The chief items of business were the election of 39 new members, the adoption of a preliminary plan for the fitting observance of the semi-centennial of the organization of the Academy three years hence, the selection of the College of Wooster as the place of the next (1938) annual meeting, the approval of the annual reports of the officers and committees, the election of officers and a nominating committee for the ensuing year, and the adoption of an amendment to the Constitution and By-Laws.

The scientific session was notably attractive, consisting of three really outstanding features: First, an illustrated address on "Scientific Research in the Antarctic" by Dr. F. A. Wade of Miami University; second, two reels of moving pictures showing "High Speed Moving Pictures of Selected Biological and Physical Phenomena" secured and presented by Dr. Alpheus W. Smith; and third, an illustrated address on "Certificates of Growing Up and Growing Old" by Dr. T. Wingate Todd of Western Reserve University.

The annual dinner on Friday evening at the Faculty Club, Ohio State University, was, by common consent, the climax of the meeting. The accommodations were ample, the food and service elegant, and the intellectual offerings brilliant and stimulating. Dr. Laurence H. Snyder served as toastmaster most acceptably, President George W. Rightmire of Ohio State University and President Otto Mees of Capital University spoke pleasing words of welcome to which President Doan of the

Academy responded briefly, and then followed the *Presidential Address* on "Modern Medicine—the Crossroads of the Social and Physical Sciences." In this address President Doan has made a notable contribution to scientific literature and it should receive widespread publication. The second address of the evening on "Science and Higher Learning" was made by Dr. Otis W. Caldwell, the genial and popular general secretary of the American Association for the Advancement of Science, and fitted the occasion perfectly.

As indicated elsewhere in these proceedings, the 161 or so papers and addresses presented in the various sectional meetings covered a wide range and great variety of topics, a few of the sectional programs extending into Saturday afternoon.

Minutes of the Business and General Scientific Sessions

Mees Hall, Capital University

(Stenographically reported by Wm. H. Howard)

Friday Morning, May 14, 1937

The meeting was called to order at 9 o'clock by President Charles A. Doan, of Ohio State University.

President Doan: Because of the number and importance of the scientific reports to be submitted, the Executive Committee thought it would be advisable to handle the business affairs of the Association this morning. In this connection, of course, we will have a short business session, including the Nominating Committee's report for officers for next year. We wish to omit the Saturday morning business meeting so as not to interfere with the regular sectional programs tomorrow. Likewise, as many visitors will be present at the banquet tonight, we want to reduce to a minimum the business affairs of the Society at that time.

The personnel of the three committees to be announced at this time will be as follows:

Membership—K. G. A. Busch, Eugene Van Cleef, Samuel Allen.

Resolutions—H. H. M. Bowman, Walter H. Bucher.

Necrology—E. N. Transeau, Raymond C. Osburn.

We would like to have reports from these committees at the close of this morning's session. We now come to the official reports of our Secretary and Treasurer. I shall ask our Secretary, Mr. Alexander, to submit his report.

(Mr. Alexander then read his report.)

PRESIDENT DOAN: I would like to take this occasion to express my own appreciation in helping with the duties of the Secretary's office and the personal pleasure it has been to cooperate with Mr. Alexander in planning for this meeting this year. What will you do with the Secretary's report?

A motion prevailed to place the report on record.

PRESIDENT DOAN: We shall now have the Treasurer's report.

DR. A. E. WALLER, Treasurer: I was asked to make this report brief.

(Dr. Waller read the report. Printed elsewhere.)

PRESIDENT DOAN: What is the pleasure of the meeting with reference to the Treasurer's report?

A motion prevailed to approve the report and place it on file.

PRESIDENT DOAN: It now becomes necessary to provide a nominating committee for the officers of 1938. The Constitution provides that the nominating committee shall be nominated and elected by ballot. We will now entertain such nominations.

PROF. WALTER H. BUCHER: I wish to offer the motion that the Vice-Presidents of the various sections this year act as the nominating committee for the coming year and that the Secretary be authorized to cast such a ballot.

This motion was duly seconded, put and carried.

MR. ALEXANDER: Mr. President, I take pleasure in casting a written ballot for the following persons: C. F. Boord, Fred Foreman, Reuel B. Frost, Clarance H. Kennedy, Ralph A. Knouff, Garry C. Myers, G. E. Owen, Claude E. O'Neal.

PRESIDENT DOAN: Under unfinished business is an amendment to the Constitution and By-laws to be acted upon at this time.

MR. ALEXANDER: At the last annual meeting of the Academy notice was given that an amendment would be offered. The Secretary was asked to prepare an amendment in line with the suggestions made at that time. We suggest the following: To Article IV add a new section to be numbered 4a to read as follows, viz.:

4a. *Membership Committee*—The Membership Committee shall consist of one member from each Section of the Academy, elected by the Section or appointed by the Vice-President of the Section, and shall seek to secure new members for the Academy, pass upon the sufficiency of applications and make report with recommendation to the Executive Committee or the Academy.

PRESIDENT DOAN: As required by the Constitution, this amendment has been announced and laid on the table for a year. It is now up for final action of the Academy if it so wishes. Are there any comments or recommendations with reference to what final action on this amendment to the Constitution should be taken? What is your pleasure?

Motion prevailed to incorporate the proposed amendment into the Constitution.

PRESIDENT DOAN: It shall be so ordered. As you know, last year the incoming president was authorized by the Academy to appoint a committee to take under advisement the proper observance of the semi-centennial of the founding of this Academy, which would occur three years hence. So at the beginning of my administration I appointed Secretary Alexander, Professor F. C. Waite, Prof. Herbert Osborn, Prof. Walter H. Bucher, and Prof. Wm. Lloyd Evans. Mr. Alexander as chairman has his preliminary report to make at this time.

MR. ALEXANDER: I regret exceedingly that Doctor Waite is not able to be present with us this morning. We fully intended to have him present this report. The report as now read is largely his work and is approved by the entire committee. I wish I could read this report as Dr. Waite could read it. It consists of two parts, namely, the report proper, and an appendix. I shall read the report proper first.

(Mr. Alexander then read the report. Printed elsewhere.)

MR. ALEXANDER: That is the report proper and I think should be acted upon first.

PRESIDENT DOAN: I know this has been given much attention to prepare so comprehensive an outline. I am sure you and I appreciate the work of this committee for the plan of an event three years in advance. It seems to me a vote of acceptance and commendation is certainly in order. Are there any suggestions or questions to the committee from the floor you would like to make at this time. You know it is proper to make them in writing at any time. Mr. Alexander is chairman of the committee, so any recommendations to him with reference to this

matter, I am sure, will be entertained most cordially by this committee. Will you accept the preliminary action of the committee?

Motion prevailed to accept the report of the committee.

PRESIDENT DOAN: Shall we hear the rest of the report?

MR. ALEXANDER: Mr. President, in view of the lateness of the hour, the full program ahead of us, and the fact that the second part of this report is simply an appendix to the first part and consists entirely of suggestions to the several committees provided for in the first part, suggestions that they may or may not follow, may I suggest the advisability of omitting the reading of the second part; simply accept it and place it on file. It also has the approval of the entire committee.

PRESIDENT DOAN: As long as the report of the committee in its fullness is on file, perhaps that will be accepted and inasmuch as the Academy has approved your outline in detail, I think the machinery has been put in motion to carry on in the fashion outlined.

I would like to say at this time to the officers and executive committee, the custom of postponing the decision of the place of meeting has been followed for a number of years. We have considered the possibility of deciding during one annual meeting the place of meeting for the next annual meeting. Therefore, I would like to say at this time we will entertain during this morning session invitations from any institution that would like to be considered for a meeting place next year. The Executive Committee is meeting at 1:00 o'clock today, and it is hoped that a decision will be reached at that time and the announcement made at the banquet tonight as to the place of the meeting for next year. I am simply making this announcement now so you can think about it and see Mr. Alexander at the close of the meeting and inform him of the desire of your groups. Apropos of this suggestion, there have been one or two invitations already received, which will be mentioned at the end of this morning's meeting. I thought perhaps some of you would like to be considering this during the morning and see Mr. Alexander in person with reference to this matter.

The hour set for the general scientific session of the Academy having arrived, I will, with your approval, declare the business meeting of the Academy in recess until after the scientific program.

THE GENERAL SCIENTIFIC SESSION

PRESIDENT DOAN, *Presiding*

PRESIDENT DOAN: The officers of the program committee found that we have been particularly fortunate in the provision of variety in our program which is prepared for this morning. We have been interested in the individuals and the work to be presented from a general scientific standpoint for some time, so we are delighted to have a resume and climax by those who have consented and have accepted very generously the invitation of the Academy to come and be with us. We have been interested, of course, in the scientific aspects of Polar explorations. We found that we have in one of our Ohio institutions an active participant in such an expedition, that here was an opportunity that we should not overlook or miss, so we have been very happy and I think very fortunate, to have Professor F. A. Wade, of Miami University, who was a member of the Second Byrd Antarctic Expedition, who will present some of his scientific findings as a part of that memorable and scientific expedition.

(Dr. Wade read his paper, which was illustrated with remarks as the slides were thrown on the screen.)

PRESIDENT DOAN: I have been thrilled with some of the experiences of phenomena with the application of high speed moving picture films, and they are yielding now to the new methods of showing vegetable growth. We have been fortunate in securing the presentation of two films taken by the Massachusetts Institute of Technology to be explained by Prof. Alpheus W. Smith. The pictures were made by Prof. Edgerton, of the Massachusetts Institute of Technology. They are being used to investigate phenomena that would elude ordinary approach. This means the possibility of probing into natural phenomena in a way not possible before. We are making the first approach in this work.

PROF. SMITH: (While slides were being thrown on the screen.) These speed films will have a great utility in the physical and biological phenomena and in scientific research. The research in this direction is not finished. There is almost no limit to the interesting information in the scientific and biological fields that can be secured; so the possibility of working the field out and leaving nothing for succeeding generations is very limited.

PRESIDENT DOAN: I am pleased to announce that beginning this afternoon at 4:15 at University Hall, O. S. U. campus, through the courtesy of Professor Smith, all who so desire may again see some silent motion pictures under the interpretation of other speakers. These films will include the moon, the solar system, the solar family, electrons, volcanoes and electrochemistry. All are invited.

It has given me very real and personal pleasure in anticipation of having Doctor Todd with us today, because ever since he has been in the department of anatomy at Western Reserve University, I have been interested in his work and have followed it very closely. It has been our privilege to work together. Dr. Todd, as you know, is a director of the Hampton Museum, and directs the Health Association of Cleveland. His topic is "Certificates of Growing Up and Growing Old." So it is with very great pleasure that I present Dr. T. Wingate Todd of Western Reserve University.

DOCTOR TODD: I think the selection of my subject has been a little ambitious. I shied at the details of the latter part, so I shall deal more particularly with "growing up." I have tried to be as impersonal as possible in this matter.

(Dr. Todd's lecture was illustrated with slides.)

PRESIDENT DOAN: Thank you very much, Dr. Todd. I feel that we have had a real treat in this scientific program, and I express to each of you who have contributed to this program very deep appreciation and thanks for being with us.

(At the conclusion of Dr. Todd's address the general scientific session was closed and the business session resumed with President Doan presiding.)

PRESIDENT DOAN: We will now proceed with the final matters of business that must come before us at this time. The next in order is the reports of standing committees and we will begin with the report of the Executive Committee by the secretary.

(The report as published elsewhere was then read.)

PRESIDENT DOAN: If there are no objections, the report of the actions of the Executive Committee for the interim between the last meeting of the Academy and this annual meeting will be accepted and filed. I think, perhaps, action is necessary upon one matter that came up during the year. The secretary has

called attention to certain correspondence regarding an exchange of honorary memberships between a Swedish organization and the Ohio Academy of Science, as outlined in the report of the secretary. At the same time the work of Dr. McClure, of Canton, China, came up, and the Executive Committee recommends that Professor McClure also be elected to honorary membership in the Academy. The Constitution provides that there be not more than 25 such members. There are at the present time only one or two members in that category, therefore, we are well within the provision of the Constitution should we decide to take this action.

Motion prevailed that the Academy elect as honorary members the four Swedish representatives and Professor McClure of China.

PRESIDENT DOAN: May we have the report of the Publications Committee, Professor Rice, chairman?

PROFESSOR RICE: There is no report to make.

PRESIDENT DOAN: Next is the report of the Research Fund, Dr. Osborn.

DR. HERBERT OSBORN: The report is in the hands of the Secretary.

MR. ALEXANDER: The report is on file and has been audited, but somehow I failed to bring it with me. Sorry.

PRESIDENT DOAN: If there is no objection, I shall rule that it be filed and made a part of the minutes.

PRESIDENT DOAN: Is there any report from the Library Committee?

MRS. ETHEL M. MILLER: I have made this report short this year.

(Mrs. Miller read her report. Printed elsewhere.)

PRESIDENT DOAN: What is your pleasure with reference to this report?

Motion prevailed to receive and file it.

PRESIDENT DOAN: Is there any report from the Committee on State Parks and Conservation?

MR. EDWARD S. THOMAS: Owing to the lateness of the hour, I want to ask that the reading of the report be omitted. However, I have some recommendations I would like to submit.

(Mr. Thomas read the recommendations. Report printed elsewhere.)

PRESIDENT DOAN: Is there any comment or discussion of this report of great importance that Mr. Thomas has just made?

Motion prevailed that the report be accepted and that the moral support be put 100% back of it.

PRESIDENT DOAN: I hope that measures will be taken to see that this is given full publicity.

MR. THOMAS: I shall endeavor to do this. The name of this Committee should be changed. The words "State Park" is more or less redundant. I would suggest that it be called "A Committee on Conservation" only. It would be much more concise and accurate.

PRESIDENT DOAN: We will be glad to take that to the Executive Committee. The next report is that of the Membership Committee.

MR. ALEXANDER: Speaking for the committee, permit me to say that 39 applications have been received and approved and their election to membership is hereby recommended.

Without reading the names, a motion prevailed that the 39 applicants for membership be elected.

A motion also prevailed that other applications received during the session be treated likewise.

PRESIDENT DOAN: Dr. Osburn will report for the Necrology Committee.

(Dr. Osburn read his report. Printed elsewhere.)

PRESIDENT DOAN: What will you do with the report?

Motion prevailed that it be received and placed on file.

PRESIDENT DOAN: A report from the joint Administrative Board and the Ohio Journal of Science is next in order.

(PROF. E. L. RICE, as Secretary of the Board, read the report. Printed elsewhere.)

PRESIDENT DOAN: What is your will?

Motion prevailed that the report be accepted and filed.

PRESIDENT DOAN: We will now have Dr. Waller's report on "Save Outdoor Ohio."

DR. A. E. WALLER: This report covers subjects covered by Mr. Thomas, but from another angle. The wildlife sanctuary has been a project of the Ohio Academy of Science for many years.

(Dr. Waller read his report. Report and recommendations printed elsewhere.)

PRESIDENT DOAN: What is your wish?

Motion by Dr. Osburn, seconded by Prof. Smith, that the report be accepted and that the Academy go on record as indorsing specifically the recommendations of the Committee, was unanimously carried.

PRESIDENT DOAN: We will now receive the report of the Nominating Committee.

(The report was submitted by Prof. Guy-Harold Smith. Printed elsewhere.)

On motion of Prof. Smith, seconded by Prof. Busch, the report was unanimously approved and made a part of the minutes of the Academy.

PRESIDENT DOAN: The officers for next year will function as indicated. The next is the report of the Committee on Resolutions.

(Report read by Dr. Walter H. Bucher. Printed elsewhere.)

PRESIDENT DOAN: What is your pleasure?

Motion prevailed to accept the report.

PRESIDENT DOAN: There are two items of new business, the fixing of the time and the place of the next meeting. As I said at the beginning this morning, it has been thought that it would be wise to have a selection of next year's meeting place made during the present meeting. In the past the Academy has entrusted to the Executive Committee the selection of the place of meeting later in the year. As previously stated, it has been thought well to select the next place of meeting while this meeting is in session. With that in mind, we will entertain invitations, and the place selected by the Executive Committee can be announced later.

Prof. R. V. Bangham invited the Academy to meet with the College of Wooster next year and the secretary read a telegram inviting the Academy to meet at the University of Cincinnati in 1938.

A motion prevailed that the Executive Committee be entrusted with the selection of next meeting place and that it be announced at the banquet.

PRESIDENT DOAN: We shall attempt to report on this tonight. If there are any other colleges wishing to be considered, give your invitations to Mr. Alexander at the close of the meeting.

Motion was offered authorizing the Executive Committee of

the Academy to fix the date of the next meeting between the 1st and the 15th of May.

PRESIDENT DOAN: Rather than holding the meeting early as in the past, it has been thought that better weather would prevail and also that many could drive in on the later date.

PROF. GUY-HAROLD SMITH: I do not have any objection to the spirit of this motion, but I think it is undesirable to limit the Committee to 15 days.

DR. HERBERT OSBORN: I think the motion would tie the hands of the Executive Committee.

PROF. E. L. RICE: I do not think that the hands of the Executive Committee should be tied.

PRESIDENT DOAN: Those in favor of the motion, raise your right hand. The motion is lost. However, I think the spirit is to arrange a meeting date most convenient for all concerned. Do you wish to select a representative on the Council of the A. A. A. S. at this time?

PROFESSOR SMITH: I move that the matter be referred to the Executive Committee.

Motion carried.

MR. ROSCOE W. FRANKS: In the past, it has been customary for the Committee on Nominations to designate the chairman of the Committee on Conservation. This time it was not done.

PROF. G.-H. SMITH: So far as we know there is no reason why we should name the chairman of that group and we left it entirely with that committee to select its own chairman.

PRESIDENT DOAN: The group will select its own chairman. Is there any other business that should come before the Academy at this time? If not, I wish to thank Capital University for their hearty cooperation in arranging for the entertainment of the Academy this year. The experiment in dual sponsorship seems to have worked well. The meeting stands adjourned.

THE SCIENTIFIC SESSIONS

GENERAL AND SECTIONAL

The following is a list of the addresses and papers presented at the general and sectional meetings of the Academy as reported to the secretary, viz.:

1. THE PRESIDENTIAL ADDRESS: Modern Medicine—the Crossroads of the Social and Physical Sciences.....DR. CHARLES A. DOAN
2. *Invitation Address:* Scientific Research in the Antarctic (Illustrated), DR. F. ALTON WADE

3. *Invitation Address:* Certificates of Growing Up and Growing Old (Illustrated).....Dr. T. Wingate Todd
4. *Invitation Address:* Science and Higher Learning....Dr. Otis W. Caldwell
5. *Moving Pictures:* High Speed Moving Pictures of Selected Biological and Physical Phenomena. Made by Professor Edgerton, M. I. T., and presented by Dr. Alpheus W. Smith.
6. The Determination of Small Mammal Populations by the Quadrat Method.....B. P. Bole
7. The Effect of Sex Ratio on Fecundity, Fertility and Mortality of the Blowfly (Phormia regina Meig).....A. C. Miller
8. Difference in Response to Meat Between Male and Female Blowfly (*Phormia regina* Meig.).....Herbert Matsumori
9. The Supramarginal Ridge in Certain American Snails.....David T. Jones
10. A Short Field Method for Determining Dissolved Oxygen in Water, Lee S. Roach
11. An Ecological Approach to the Identification of Birds of Northwestern Ohio.....Irene T. Rorimer
12. Life History and Ecology of Opalina.....F. O. Hazard
13. Ohio Fisheries Statistics.....E. L. Wickliff
14. Manayunkia, a Freshwater Polychaete from Lake Erie.....F. H. Krecker
15. Bubble Nest Activity of *Betta splendens* under Controlled Conditions of Light and Temperature.....Virginia Bennington
16. Prenatal Development of the Water Snake, *Natrix sipedon* (L), John W. Price and Milton P. Solomon
17. Notes on the Development of the Central Nervous System of Black Blowfly.....Paul E. Schaefer
18. Order of Differentiation of Gamic Female Aphids.....Chester A. Lawson
19. Looking for Endoproctous Bryozoa in Bermuda.....S. R. Williams
20. Tagging Native Stream Fish.....Ralph V. Bangham
21. Transplanted Lateral-line Organs in the Tadpole.....Henry Federighi
22. The Animal Population of Aquatic Plants.....F. H. Krecker
23. Five Years of Field Observations on the Eastern Chipmunk (*Tamias striatus fisheri* Howell).....Arthur B. Williams
24. Ecology of Ohio Camel-crickets (Orthoptera: Gryllacrididae), Edward S. Thomas
25. The Analysis of Human Inheritance in Data Comparing but a Single Generation.....Charles W. Cotterman
26. Facilities for Vertebrate Research in Ohio.....Lawrence E. Hicks
27. Progress Report of the American Fish Policy.....E. L. Wickliff
28. "Reduced," A New Mutation in *Drosophila Ananassae*, Harrison D. Stalker
29. Methods of Improving Fish in Lakes and Ponds of Ohio....T. H. Langlois
30. Zonal Distribution of Mosses on Mount Rainier.....E. T. Bodenberg
31. The Ohio State Moss Herbarium.....R. T. Wareham
32. A Lichen Succession on Blackhand Conglomerate Cliffs of Hocking County, Ohio.....John N. Wolfe
33. Notes on Ohio Violets and Additions to the State Flora.....F. O. Grover
34. Vegetation of Muskingum County, Ohio.....Charles A. Dambach
35. Additions to the Revised Catalog of Ohio Vascular Plants, John H. Schaffner
36. Plant Remains Found in a Lignite Deposit of Central Ohio, Robert K. Lampton
37. The Gray Mold Disease of Greenhouse Tomatoes.....T. W. Bretz
38. Some Incrusting Forms of Telephora.....S. S. Humphrey
39. Basidiomycetes of the Chagrin River District of Northern Ohio, Mrs. Harvey Bingham
40. A Key to the Ohio Apple Disease.....W. G. Stover
41. The Rice Industry of South Carolina.....A. E. Waller
42. The Ethno-botany of the Ohio Aborigines.....H. C. Shetrone
43. Some Physiological Studies in the Thermal Algae of Yellowstone National Park.....O. L. Inman
44. Initial Studies in Antibiosis Between Lower Organisms, Const. J. Alexopoulos
45. The Relation of Stump Height to the Sprouting of *Ostrya virginiana*, Oliver D. Diller

46. Copper Solutions for Microscopical Detection of Glucose and Fructose, Elizabeth S. Bretz
47. The Vegetation of Meigs County, Ohio.....Clyde H. Jones
48. Some Micro-organisms from the Olentangy Shale.....Grace A. Stewart
49. Three New Species of Tetraseptate Corals from the Hamilton of New York.....Daniel A. Busch
50. Fauna of the Typical Olentangy Shale.....Clinton R. Stauffer
51. Richmond Dalmanella Bed Invaded by Carnivorous Gastropod, Walter H. Bucher
52. The Overlap Relation of the Chattanooga Shale.....Harry J. Klepser
53. The Hot Springs District of Virginia.....Arthur Bevan
54. Structures in the Pliocene Lavas of McCoy, Eagle and Routt Counties, Colorado.....Henry F. Donner
55. A Generalization of the Structure of Ohio, Indiana, and Michigan, J. R. Lockett
56. The Problem of Silicosis and Other Dust Diseases.....Charles B. Moke
57. Some New Mineral Occurrences in Southwestern Ohio.....John Sarles
58. Level and Flat.....George D. Hubbard
59. Recent Earthquakes in Western Ohio.....John T. Rouse and R. R. Priddy
60. Meteorologic Factors of the 1937 Flood.....Paris B. Stockdale
61. Flood Prevention in the Ohio Valley.....J. J. Wolford
62. Mechanism of Iron Transportation in the Blood Stream: Its Significance in Anemic States of Varied Etiology.....Carl V. Moore
63. The Normal Urinary Excretion of Iodine, Italo D. Puppel and George M. Curtis
64. The Increased Urinary Excretion of Iodine in Hyperthyroidism, George M. Curtis and Italo D. Puppel
65. Ketene as a Detoxifying Agent.....M. J. Boyd
66. Composition of Human Saliva as Affected by Atropine and Pilocarpine Stimulation.....Henry Limbacher and J. B. Brown
67. Chemical and Physiological Properties of Dacryorrhetin...Shiro Tashiro
68. Estimation of Vitamin A Deficiency.....Rollin R. Durant
69. Influence of Cortin on Renal Excretion in the Normal Organism, Frank A. Hartman, Lena Lewis, and Gwendoline Toby
70. Effect of Cortin Injection on the Urinary Ammonia Excretion..Lena Lewis
71. Histological and Chemical Analysis of the Lipids of the Adrenal Cortex of the Guinea Pig in Pregnancy, Fatigue and Starvation, Bernard M. Schneider
72. Effect of Cold and Double Adrenalectomy on Metabolism, Steven Horvath
73. Effect of Adrenal Cortical Extract on the O_2 Consumption of Human Beings.....Fred A. Hitchcock
74. Experimental Studies on Ovulation, A. J. Derbyshire and Hans O. Haterius
75. Human Ovulation.....Kelley Hale
76. Endocrine Functions of the Placenta.....Hans O. Haterius
77. Total Distribution of Taste Buds on the Kitten Tongue at Birth, Rush Elliott
78. Birefringence of Muscle.....Emil Bozler
79. Differential Reaction of Bone Marrow and Lymph Node to Hyperpyrexia, C. A. Doan, Malcolm M. Hargraves and Lucile Kester
80. Propagation of Vaccinia Virus in the Rabbit Fetus, Fred W. Gallagher and Oram C. Woolpert
81. Patent Ductus Arteriosus with Infected Thrombus Simulating Subacute Bacterial Endocarditus...Ray Brown, F. L. Ferguson and T. T. Frost
82. Effects of Posture on Respiration in the Human, J. K. W. Ferguson and Fred A. Hitchcock
83. Comparative Histology of the Reptilian Oesophagus, Lawrence I. Goldberg
84. Effect of Splenectomy of the Rat on the Weight of the Hypophysis, Linden F. Edwards
85. The Nature of the Human Pulmonic Alveolar Wall...Dwight M. Palmer
86. Thyroid-Adrenal-Brain Relationships in Vertebrates.....D. P. Quiring
87. Does Resection of the Nerves of the Mandible Affect Development of the Teeth?.....Paul C. Kitchin and Linden F. Edwards

88. Relationship between Basophilic Infiltration of the Neurohypophysis and Hypertensive Disorders.....HORACE B. DAVIDSON and JOHN R. ROSS

The next five papers were given as a *Symposium on the Neurone:*

89. The Structure of the Neurone as Revealed by Polarized Light, HUGH SETTERFIELD
90. Metabolism of the Neurone.....ROBERT GRUBBS
91. Neuro-Hormones.....EMIL BOZLER
92. Nature of the Conduction of the Nerve Impulse.....ARTHUR DERBYSHIRE
93. Neurotropic Viruses with Special Reference to Poliomyelitis, N. PAUL HUDSON
94. Dunlap's Beta Hypothesis Applied to Learning to Spell, MARY K. VALENTINE
95. Preliminary Report of Results Obtained from a New Type of Maze, WINFORD L. SHARP
96. Changes in Interest and Social Activities Over a Four-year College Period.....RICHARD WILKINSON
97. Binocular Interdependence in "Non-Corresponding Point" Stimulation, S. R. WALLACE, JR.
98. An Experiment in College Guidance.....EVERETT H. HOPKINS
99. Functional Indications of Improved Associations in Normal Adults Taking Amino-Acetic Acid.....FLORENCE MATEER
100. A Hazard in Altitude Testing.....RALPH C. IRWIN and H. B. ENGLISH
101. Needed Research in the Psychology of Music.....GORDON HENDRICKSON
102. Transfer of Training in Learning to Hit a Submerged Target, WILLIAM H. SCHROEDER
103. A Preliminary Report on Time Discrimination in the Chick, AMOS C. ANDERSON
104. An Activity-Project Program of Instruction in Educational Psychology, HARRIET M. HICKS
105. Some Factors Which Influence the Determination of Gustatory Thresholds.....R. H. SCOFIELD
106. The Scientific Nature of the Case Method.....STANLEY MARZOLF
107. A Study of Speed vs. Accuracy in the Acquisition of Motor Skill, WILBUR D. WEST
108. Some Relationships of Speed to Other Measures of Ability and Achievement.....JAMES P. PORTER
109. Zeeman Effect Studies in Neon.....J. A. PEOPLES, JR.
110. Intensity Measurements in the Calcium Spectrum.....JACK SMITH
111. A Search for the Spectrum of Doubly Excited Helium.....F. P. BUNDY
112. Variate Atom Equipoints and Mixed Crystals in Their Relation to Space-Group Theory.....F. C. BLAKE
113. The Absorption Spectra of Pure Chlorophyll *a* and *b* in Ether Solution, H. V. KNORR and V. M. ALBERS
114. The Absorption Spectrum of Chloroplasts in Living Cells, H. V. KNORR and V. M. ALBERS
115. Frequency Measurements in the Elementary Laboratory.....WILL C. DOD
116. Phase Changes in Resonant Circuit, and Effect of Polarized Light on a Photronic Cell.....ALVA W. SMITH
117. The Infra-red Absorption Spectrum of the Deuterium Selenides, WILLIAM C. SEARS
118. Stars with Composite Spectra.....J. A. HYNEK
119. Intensities of Forbidden Lines in the Spectra of Novae, N. T. BOBROVNIKOFF
120. Improved Apparatus and Techniques for the General Laboratory, LEROY EDWARDS
121. Making Stresses Visible.....ROYAL WELLER
122. A Lightning Flash and Its Components.....JOHN G. ALBRIGHT
123. Cross Hairs.....RICHARD M. HOWE
124. An Empirical Equation for Loudness.....H. P. KNAUSS
125. The Addition of Two Frequencies in Audio Apparatus...DARRELL B. GREEN
126. The Viscosity of Sols Made from X-irradiated Substances, C. HARRISON DWIGHT and H. KERSTEN
127. Some Political and Trade Barriers to the Division of Labor, ALFRED ARCHER
128. Geography of Civilization and Culture.....GEORGE D. HUBBARD

129. Significance of the Evolutionary Nature of Georgaphy, KYLE W. ARMSTRONG
130. Notes on the Geographic Philosophy.....RODERICK PEATTIE
131. The Distribution of University and College Teachers of Georgaphy, C. E. COOPER
132. Temperature Influences of Lake Erie.....ROBERT SCHLOEMER
133. A Sketch of the Geographic Evolution of the Fox Wisconsin Portage, JOHN H. GARLAND
134. The Anthracite Landscape.....RAYMOND E. MURPHY
135. A Reconnaissance Survey of Lynchburg, Va.....JAMES A. BECK
136. Flood Control in the Muskingum Valley.....C. C. HUNTINGTON
137. Wadsworth, Ohio—A Detached Fragment of Greater Akron, EVELYN WESTON
138. Some Aspects of the Political Geography of the Low Countries, J. O. M. BROCK
139. A Simple Gasometer.....W. C. EBAUGH
140. Efficient Laboratory Distillation.....PHILIP R. FEHLANDT
141. Capital University Chemistry Project No. 5—Assembly for Class Demonstrations of Vacuum Tube Phenomena, K. G. BUSCH, W. TOOR, R. HEISCHMAN and R. THAYER
142. Special Student Problem on Soil Analysis—Project No. 4, GROVER L. ORR and LLOYD JESSEN
143. A New Unit Plan for Individual Instruction in General Chemistry, G. W. H. POWELL
144. Experiences Teaching Proficiency Students in Chemistry, W. CONRAD FERNELIUS, LAURENCE L. QUILL and WM. LLOYD EVANS
145. Training Graduate Students as Teachers, LAURENCE L. QUILL, W. CONRAD FERNELIUS and WM. LLOYD EVANS
146. The Methods Course in Chemistry.....M. P. PUTERBAUGH
147. Synthesis of 1, 2-Benzanthracene Derivatives Related to 3, 4-Benzpyrene.....MELVIN S. NEWMAN
148. The Newer Approaches to the Study of Biological Significance of the Lipids. 1. Chemical. 2. Cytological. .A. W. BOSWORTH and J. H. AKEROYD
149. A Modified Ferric Alum Solution for Use in the Permanganate Titration of Cuprous Oxide in the Bertrand Sugar Determination and the Substitution of Dichromate for Permanganate for the Titration, E. D. WITMAN
150. An Experimental Study of Glucose Formation from Fat in the White Rat Using a Modified Respiratory Apparatus.....C. B. MARQUAND
151. Occurrence of Porphyrins in the Urine in Sulfonal Poisoning, PAUL ROTHEMUND
152. Isolation of a Crystalline Vitamin A Concentrate, RUTH E. CORBET and HARRY N. HOLMES
153. The Use of the Chain Hydrometer in the Preparation of Standard Solutions of Hydrochloric Acid.....R. V. SINNETT and C. W. FOULK
154. Electrometric Indicators and the Dead Stop End-Point System, D. R. CLIPPINGER and C. W. FOULK
155. The Effect of Calgon on the Hardness of Water.....SAMUEL SHENKER
156. Solubility of Mercuric Oxide in Alkali and Alkaline Earth Solutions, ALFRED E. HIRSCHLER and ALFRED B. GARRETT
157. Studies on the Rare Earth Nitrates, RICHARD F. ROBEY and LAURENCE L. QUILL
158. Preparation and Properties of Some 1, 2, 3 Triazoles, N. O. CAPPEL and W. CONRAD FERNELIUS
159. Absorption Spectra of Certain Indigoid and Thioindigoid Dyes, RONALD B. SPACHT and W. R. BRODE
160. The Synthesis of Olefins of Type IV.—Trialkylethylenes, C. E. BOORD and AMOS G. HORNEY
161. The Dipole Moments of Acid Chlorides; Resonance in Molecules, SISTER MARY MERCEDES

Report of the Secretary

For the Year 1936–37

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

The work of the Secretary's office, as in past years, has gone along quite harmoniously through the year now ending, without serious interruption and we believe with reasonable success. We have had the most loyal co-operation possible on the part of the entire official family and we have met with the utmost courtesy and consideration on the part of the membership at large, whose servant we are and whom we serve with gladness. It has been a real joy to serve with President Doan and support in every way possible his efforts to advance the interests of the Academy. We have never known an era of greater enthusiasm and good will in the Academy than now prevails as shown by the large enthusiastic attendance at this meeting.

So many of the details that pass through the Secretary's office and are partly if not wholly taken care of there are covered by or included in the reports of other officers or committees that as a rule only minor matters remain for this office to report.

The Secretary again had the honor, through the courtesy of the Executive Committee, to represent the Academy on the Council of the American Association for the Advancement of Science at the Atlantic City meeting and also at the Academy Conference of which he, for a second time, had the honor to be its president. This Academy Conference is designed to be a sort of clearing house of helpful ideas and information particularly helpful to academy secretaries. To say the least, the inspiration a secretary may gain at one of these conferences is worth the time and cost, as he should be a better secretary thereafter.

By personal conferences with the officials of the Association we succeeded in securing a generous allowance for research among our members, although we had really and technically forfeited our claim by our failure to comply fully with the terms of the grant. The thanks of the Academy are due Dr. Otis W. Caldwell, the distinguished general secretary of the Association, who we hope will honor us with his presence at this meeting. He is our friend.

As chairman of the special or preliminary committee appointed by President Doan to outline a plan for the proper observance of the 50th anniversary of the organization of the Ohio Academy of Science, three years hence, we have given much time and thought to this matter, as have the other members of the committee. We trust the results of our deliberations will commend themselves to you, at least to the extent of being a good beginning, and may point the way to a plan that will make the observance of the semi-centennial of the Ohio Academy of Science an outstanding event in the march of Science not only in Ohio but in the country as a whole. To do this, however, will require the full, hearty, enthusiastic co-operation of every member of the Academy.

We certainly do not arrogate to ourselves as chairman of the program committee any special credit for the fine, rich programs, both general and sectional, prepared for your profit and pleasure, but we may with propriety cite this fact as evidence of the fine spirit of co-operation that prevails in the Academy at this time. We think the vice-presidents have done unusually well.

As mentioned in the report of the Executive Committee, the Academy has made a beginning in the matter of exchange of corresponding, or honorary members, between the Ohio Academy of Science and other organizations, foreign and domestic. This will probably result, let us hope, in the adoption and making of a suitable Academy seal.

Again, hearty thanks, good friends, for your many and repeated expressions of your confidence, the honor of serving you, and your sympathetic co-operation.

Respectfully,

WILLIAM H. ALEXANDER,
Secretary.

Accepted and ordered filed by unanimous vote of the Academy May 14, 1937.

Report of the Auditor

To the Ohio Academy of Science:

Following is the Balance Sheet of the Ohio Academy of Science as at December 31, 1936:

OHIO ACADEMY OF SCIENCE BALANCE SHEET
As at December 31, 1936

ASSETS

Cash in Bank—Huntington National	$ 185.41	
Bonds	1,300.00	
*Stock—Ohio National Bank (cost)	437.50	
Total Assets		$1,922.91

SURPLUS

Surplus	$1,922.91

* In the account of the Research Fund.

STATEMENT OF RECEIPTS AND DISBURSEMENTS
For the Year Ending December 31, 1936

RECEIPTS

Bank Balance—Huntington National Bank		$ 195.59
Sale of Publications	$ 34.20	
Dues	1,041.30	
		1,075.50
Total Cash		$1,271.09

DISBURSEMENTS

Office Expense	$ 20.00	
Preliminary Announcements	12.88	
Stamps and Stationery	22.16	
Secretarial Services	51.00	
Expenses to Executive Committee	18.15	
Auditing Service	3.00	
Registration Cards	3.87	
Bank Service Charge	8.10	
Vice-President Expenses—Chemistry Section	5.59	
Invitation Speaker	50.00	
Expenses, Toledo Meeting	18.24	
Programs	57.43	
Vice-President Expenses—Botany Section	9.33	
Vice-President Expenses—Physics Section	11.25	
Vice-President Expenses—Psychology Section	14.25	
Expenses—Zoology Section	15.00	
Stenotypist's Service	5.75	
Secretary's Honorarium	100.00	
Guest Speaker, Medical Section	35.00	
Ohio Journal of Science (Paid up Membership)	577.50	
Secretarial Services	20.68	
Letterheads	9.86	
Vice-President Expenses—Geology Section	5.50	
Statements	9.64	
Stenographic Service	1.50	
Total Expense		1,085.68
Cash Balance		$ 185.41

I have completed the audit of the books for the Ohio Academy of Science for the year ending December 31, 1936, and have found the following facts to be true:

1. There is $185.41 in cash which is held on deposit with the Huntington National Bank.

2. The $1,300.00 in bonds were verified by the Ohio National Bank.

3. There are $437.50 in stock of the Ohio National Bank, which is valued at cost.

4. The members ledger was checked in detail and was found to be correct as to the amount received.

5. All invoices were checked in detail as to the amounts disbursed.

I certify that the above statements set forth, to the best of my knowledge, the true and correct financial condition of the Ohio Academy of Science as at December 31, 1936.

Respectfully submitted,

BRYAN HARTLEY,
Assistant Fraternity Auditor,
Ohio State University.

Report of the Preliminary Committee on 50th Anniversary of the Ohio Academy of Science

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

Your Committee appointed by President Doan, pursuant to a motion passed at the Toledo meeting of April, 1936, submits the following report:

We heartily commend the celebration of the semi-centennial of the *Ohio Academy of Science* and believe that this should be done in a distinctive and comprehensive manner that will not only commemorate what has been accomplished in the past fifty years, but will also stimulate yet greater endeavor in the future. We hope that the program will be sufficiently worthy that the proceedings when published will be a real contribution to the literature of science and of scientific organizations.

To this end we make the following recommendations:

1. That the 50th Annual Meeting be held at the Ohio State University in Columbus, the birthplace of the Academy, in 1940, the month and days to be designated later.

2. That the meetings of 1938 and 1939 be held elsewhere than in Columbus.

3. That the 50th meeting be devoted entirely to the semi-centennial celebration, consisting of two major parts, one *historical* and the other *scientific*.

4. That the meeting be organized and carried through by a Director and ten committees.

5. That the Director have general supervision of the entire celebration and be ex-officio a member of each committee.

6. That the Nominating Committee for the 1938 meeting present one or more suggestions for the position of Director and that their suggestion or suggestions for this position be announced at the first business session of the meeting of 1938 and voted on at the final session of that meeting.

7. That the committees be grouped into two groups on the basis of the sequence of their activities.

8. That each committee consist of not more than three members, and that not more than one honorary member may be, but not of necessity must be, added to each committee.

9. That the committees be as follows:

GROUP A

(1) On Publicity, both preliminary and current.
(2) On Program.
(3) On Speakers, including guests.
(4) On Invitations.
(5) On Historical Statistics and Lists.

GROUP B

(6) On Exhibits.
(7) On Memorials.
(8) On Dinner.
(9) On Finances.
(10) On Publications.

10. That the Executive Committee choose and appoint at least the chairman of each of the five committees in Group A, not later than December 1, 1937, with the expectation that a preliminary report from these five chairman will be presented at the 1938 meeting.

11. That the completion of all committees be accomplished not later than December 1, 1938, and that all committees report either separately or through a general report by the Director at the 1939 meeting.

Respectfully submitted with the understanding that when amended and adopted the carrying out of these recommendations be the duty of the officers and executive committee of the Academy.

W. H. ALEXANDER, *Chairman*,
F. C. WAITE,
HERBERT OSBORN,
WALTER H. BUCHER,
WM. LLOYD EVANS.

APPENDIX

In the preparation of this report suggestions have been made which may be useful to the committees and same are here recorded, but are not a part of the report of the committee and therefore are in no way mandatory.

A. We believe that great care should be exercised in the selection of the Director and the members of the committees. Choice should be based on willingness and ability to give this service, rather than on any attempt to bestow honors. To care for this feature the honorary members of the committees are suggested.

B. Invariably unmodified consent to serve should precede appointment.

C. Selection of members of each committee with some regard to geographical proximity will permit meetings of committees and promote efficiency.

D. If the chairman of a committee be first chosen and then asked for suggestions as to other members of his committee it will promote the activity of each committee.

E. We suggest that the program be divided into a historical part to occupy approximately three-fourths of the meeting, and a scientific part.

F. The scientific part should consist of three, four or five papers of scientific worth rather than of historical value, in order to stimulate the scientific activity of the society. For these speakers we suggest securing scientists of national repute, each in a different field, to represent the

wide interests of the Academy. If men who are natives of Ohio or have been former residents of the State can be secured it will be more appropriate. It is suggested that the scientific program be entirely by visiting speakers, but that papers read by title from members of the Academy may also be carried on the program.

G. In addition we suggest that the representative of the American Association for the Advancement of Science and the designated representatives from each of the academies of the five adjoining states (Michigan, Indiana, Kentucky, West Virginia, Pennsylvania) be asked to take a minor part in the program, such as brief remarks, at the dinner.

H. To the committee on exhibits, we suggest an exhibition of scientific apparatus used fifty years ago and now, and a limited exhibition of text-books used fifty years ago and now, possibly arranged according to fields covered with perhaps some scientific exhibits that are distinctly Ohioan, such as fossils or type specimens, and scientific books by Ohio authors.

I. To the Committee on Historical Statistics and Lists, we suggest that tabular statements, supplemented perhaps by charted graphs, be used as far as possible, showing, among other things, the number of papers presented during the last fifty years, divided into fields of work, the total number of individuals who have had places on the programs, a complete list of all general officers with a short biographical sketch of the presidents, such as in American Men of Science, and possibly a complete list of all who have been members of the Academy during the past fifty years. It may be possible to assemble a synopsis of contributions to science in Ohio before the Academy was founded, with a list of leading writers and papers and scientific organizations within the State. Possibly an addition of pictures of early Ohio scientists and a list of outstanding scientists who have been born in Ohio or educated in Ohio, or did scientific work in Ohio. This might be cared for by a paper on the program entitled "Science in Ohio before 1890."

J. To the Committee on Memorials, we suggest the possibility of building up by solicitation of the capital of the *Research Fund*, same to be placed in the Irreducible Debt Fund of the State of Ohio, the law permitting; also the erection in a place to be selected of a bronze tablet, possibly the gift of some friend of the Academy.

K. To the Committee on Publications, we suggest as a primary aim the preparation of a volume or record suitable for wide distribution which should contain, of course, an account of the semi-centennial, perhaps most of the statistical summaries regarding the Academy, but should not attempt generalized historical sketches on the progress of science, but should be confined, rather, to local (Ohio) scientific history, especially of accounts of incidents and anecdotes which illuminate the mind and circumstances of a given period, since future generations will look upon the mere factual contents of local history as secondary to these. The older members of the Academy who know the facts owe it to the coming generation to put these human documents into the record before they vanish from the field.

L. To the Finance Committee, we suggest a small registration fee and solicitation of special gifts to be used chiefly in defraying the traveling expenses of the principal invited speakers.

Respectfully submitted, with request that the committee be discharged.

W. H. Alexander, *Chairman*,
Walter H. Bucher,
F. C. Waite,
Herbert Osborn,
Wm. Lloyd Evans.

Report of the Executive Committee

Columbus, Ohio, May 14, 1937.

To the Ohio Academy of Science:

The meetings of the Executive Committee during the year have been timely, well attended and characterized by the free, frank and intelligent discussion of all matters pertaining to the good of the Academy. Details were promptly taken care of. Only a few matters were of such nature as to require the action of the Academy or of sufficient importance to merit the attention of the Academy. The following, however, do seem to require such action:

1. Early in the year there came to the President of the Academy and by him referred to the Committee a proposal from Dr. Fredericks Son on behalf of a Swedish organization (apparently genealogical in character) to enter into "an exchange of corresponding members between our respective Societies in order to promote a more intimate collaboration between U. S. A. and Sweden." The proposal, in brief, is for the Swedish organization to "immatriculate" three members of the Ohio Academy of Science as honorary members and for the Ohio Academy to immatriculate three of its members into the Ohio Academy, without dues in both cases. Dr. Fredericks Son suggested the following names: (1) Henric-Leonardsson Westman, (2) Dr. Adelbert Fredericks Son and (3) Dr. Georg-Georgsson Akerman. The committee looked with favor upon the proposal and authorized the President to nominate three persons for membership in the Swedish organization, whereupon he suggested the following names: William H. Alexander, Frank A. Livingston and Dr. Laurence H. Snyder. Dr. Fredericks Son courteously insisted upon adding the name of our President, Dr. Charles A. Doan. The committee now submits the matter to you for your approval or disapproval.

Relative to honorary memberships in the Academy, the Executive Committee put itself definitely on record as of the opinion that these do not entitle such members to the free receipt of the *Ohio Journal of Science* since it seems reasonable to assume that said members will have access to the Journal at a near-by institution that is already on the exchange list of the Academy.

Further, it may be said, incidentally, that the final approval of this exchange of members would seem to require the adoption of a suitable academy seal to be attached to the certificates of membership issued to these alien organizations. To this end, action has already been initiated looking to the securing of such a seal. The fact is your committee feels that the Academy should have a seal for other purposes.

2. The committee approved a proposed amendment to the Constitution and By-Laws prepared by the secretary making the committee on membership permanent. Its approval by the Academy is hereby recommended.

3. Two vacancies occurring during the year in the list of vice-presidents were filled by the committee, namely, Dr. C. F. Boord was made vice-president of the Section of Chemistry, vice Dr. A. P. Mathews, declined, and Dr. Clarence H. Kennedy was made vice-president of the Section of Zoology, vice Dr. A. W. Lindsey, resigned.

4. The committee recommends the election of Dr. F. A. McClure, now professor of botany at Lingnan University, Canton, China, to honorary membership in the Academy.

Respectfully submitted,

WILLIAM H. ALEXANDER,
Secretary.

Report accepted and placed on file by unanimous vote of the Academy with the understanding all recommendations made therein are approved.

Report of the Library Committee

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

More requests than usual have been received this past year for missing numbers of the *Ohio Journal of Science.* Such numbers are usually sent, depending upon the supply in stock. All such requests were granted this year except in a few instances where entire sets of the *Ohio Naturalist* and the *Ohio Journal of Science* were wanted. Some gaps in the sets of the periodicals which are received in the Ohio State University Library have been filled in by the organizations which exchange with the Ohio Academy of Science.

One exchange was resumed which had ceased at the time of the war. Our publications had been sent before the war, but somehow none had been received in return. Hence nothing was known about this exchange until a letter came this winter asking that the exchange of publications be resumed. This Society has sent a shipment consisting of ninety-nine volumes of its publication covering the years from 1904 on to date and it has offered to send the volumes from 1889 to 1903 inclusive if they should be desired. The shipment which has

been sent has not yet been received. In return a shipment has been sent from here which contained all the numbers of the *Ohio Naturalist* and of the *Ohio Journal of Science* which were lacking from the library of this Society.

Four new exchanges were secured during the year and eight were dropped as publication of their journals had been discontinued. When it is resumed these exchanges can likely be secured again if desired. The total number of exchanges is now 372, of which 104 are in this country and 268 in foreign countries.

The sales of publications amounted to $37.10. Fourteen sales were made and seventy-six items were sold, consisting of thirty-six Special Papers and forty Annual Reports. "The Odonata of Ohio," by D. S. Kellicott, and the "Flora of the Oak Openings West of Toledo," E. L. Moseley, were in greatest demand.

In order to avoid any possible difficulty with the Tax Commission of Ohio it seemed wise to secure a vendor's license. This was done October 1, 1936. So far only two sales have required the tax stamps. However, it is a satisfaction to know that the law is not being violated.

At the close of the fiscal year the only outstanding bill was the one for 1935 which was reported last year. It has since been paid.

The sum of $31.07 is still on deposit in the building and loan company. This sum represents only the dividends which were earned by the money from sales when deposits were made in former years. No money has been deposited for five years, but instead it has been paid directly to the Treasurer each year. The dividends have amounted to $35.82, but the sum of $4.75 was withdrawn at the time when the last of the sales money was taken out and was paid to the Treasurer. The sum now remaining in the bank is earning a trifle over a dollar a year.

Respectfully submitted,

ETHEL MELSHEIMER MILLER,
Chairman.

Report of the Joint Administrative Board of the Ohio Journal of Science

COLUMBUS, OHIO, May 13, 1937.

To the Ohio Academy of Science:

A meeting of the Joint Administrative Board was held at the Bancroft Hotel, Springfield, Ohio, on April 23, 1937. Meeting was called to order by Chairman Rice about 2:00 P. M. All members of the Board, the Editor, and Business Manager were present. All incumbent officers were re-elected for 1937.

Subject to their acceptance Prof. W. H. Shideler, of Miami University, was elected sub-editor for Paleontology, replacing August F. Foerste, deceased, and Prof. H. H. M. Bowman, of the University of Toledo, was elected sub-editor for Botany, replacing Prof. L. H. Tiffany, resigned.

Upon motion it was declared policy of the Journal that cuts would be returned to authors on request with the understanding that the Journal retains the right to their use in the future.

Upon motion it was declared policy of the Journal that permission will be given to quote the Journal upon request, provided permission of the author is granted.

The Business Manager presented his financial report as follows:

OHIO JOURNAL OF SCIENCE
FISCAL YEAR 1936

RECEIPTS

Balance from 1935	$ 115.73
University Grant	750.00
Ohio Academy of Science	577.50
Ohio Academy of Science, Proceedings	130.40
Subscriptions	77.68
Sales of Back Numbers	36.50
Author's Payments for Plates and Publications out of Order	96.37
	$1,784.18

EXPENDITURES

Spahr & Glenn Co., Vol. 35, No. 6	$ 166.35
Spahr & Glenn Co., Five Numbers of Vol. 36	1,083.43
Bucher Engraving Co	145.44
Postal Charges	97.69
Envelopes and Stationery	37.85
Clerical Assistance	5.00
Bank Charges	.50
	$1,536.26
Balance on hand Feb. 5, 1937 (Huntington National Bank)	247.92
	$1,784.18

The bill for the September, 1936, number of the Journal, amounting to $249.50, is still unpaid. All other 1936 bills are paid.

Motion carried that report be accepted and placed on file.

Dr. Transeau was appointed a committee of one to audit the report.

The meeting adjourned about 3:00 P. M.

Respectfully submitted,

B. S. MEYER,
Secretary.

Report of the Committee on State Parks and Conservation

May 14, 1937.

To the Ohio Academy of Science,

The past year has seen continued activity in a great variety of conservation matters. The establishment of a co-operative wild life research station at Columbus, Soil Conservation activities, sealing of abandoned coal mines, construction of reservoirs for the conservation and control of water, acquisition of forest areas and other important projects

have contributed toward another outstanding year in conservation annals.

Soil Conservation.—During the past year the U. S. Soil Conservation Service has continued its important functions in Ohio.

Watershed projects at Zanesville, Wooster, Mt. Vernon, and Hamilton are leading the way, and a new 74,000-acre similar project near Senecaville will soon swing into action. Sixteen CCC camps carry the work forward on other fronts. In co-operation with the Agricultural Extension Service, the Soil Conservation Service is showing farmers how they can control erosion—and adoption of approved soil conservation practices is spreading.

Strip cropping, a method of cultivation in which contour strips of close-growing, soil-binding grasses are alternated with similar bands of clean-tilled crops, is advocated for many slopes. Contour tillage, or plowing across the slopes rather than up-and-down hill, is recommended for most rolling fields. Terracing is demonstrated in a minor degree in certain sections of the state.

Woodlands are receiving more and more recognition as an essential part of the co-ordinated program of erosion control. Land covered by forest provides an excellent example of how nature originally protected the soil. The forest floor is covered with a litter of fallen leaves and twigs and decaying vegetative matter, rich in humus that is sponge-like in its ability to absorb and hold water.

Protecting woodlots by fence, wherever possible, allows underbrush and new trees to obtain sufficient growth. A woodlot thus protected insures against soil erosion and also provides ample food and cover for game birds and other wild life. In general, the steeper slopes are being returned to permanent woodlands. Slopes not quite so steep, yet too steep or too eroded for profitable cultivation, are retired to permanent pasture.

Longer crop rotations are being advocated by the Service, a four-year rotation of corn, wheat, and two years' meadow being the most common type recommended. Liming and fertilizing are an essential part of the program. Gullies are being controlled by vegetation wherever possible, although temporary check dams are sometimes necessary.

Controlling erosion through vegetation will also conserve wild life, soil conservationists point out, since the two needs of wild life that go hand in hand are food and cover, and both are supplied by vegetation. Farm ponds are proving valuable in conserving water for use during intermittent periods of drought, and for control of erosion. They also serve a useful purpose in wild life conservation by furnishing a haven for wild ducks and geese, and, if properly cared for, may often be stocked with fish.

In general, the erosion control program being advanced by the Soil Conservation Service is a general land use program, in which each acre is put to its proper use. In March, 1937, more than 260,000 acres were under co-operative agreement with the Service, and the number is still growing. Moreover, and a heartening sign, thousands of farmers outside of project and camp areas are adopting similar practices on their own initiative. Soil conservation is fast becoming a reality.

Biologists will commend the policy of the Service in making wild life research an important element of the soil conservation program.

Sealing Abandoned Coal Mines.—Since its inception in December, 1934, the mine sealing project has resulted in the closing of more than 19,500 mine openings of various types in Ohio. The work is being actively carried on in 22 counties, giving employment to about 750 workmen. To date, about $740,000 of federal funds have been expended on this work including funds supplied by CWA, ERA, and WPA. The average cost of closing each opening is about $39.90. It was originally estimated that there were about 25,000 openings to abandoned mines in this state. To this number must be added about 5,000 openings in mines abandoned during the last three years. At the present time about 1,000 openings are being closed per month. Hence it will require about one year to complete the work.

The work already completed has resulted in a considerable reduction in the amount of acid and iron discharged to the streams of Ohio in drainage from abandoned mines. Reductions of from 50% to 75% in the acidity of mine drainage in one year's time after sealing are not uncommon. Frequently reductions of two or more tons of acid per day in the drainage from one large mine are brought about by the mine sealing program. Already streams in the coal mining area of Ohio are showing marked improvement.

While the funds for this work are provided by the federal government as a part of its work relief program, the technical supervision of the project is under the direction of engineers of the U. S. Public Health Service and the Ohio Department of Health. After the federal program is completed, it will be necessary to enact legislation requiring that the openings to mines now active be sealed when abandoned. In order to obtain the fullest benefit from the work it is necessary that the seals be maintained in air-tight condition and that cave-ins be closed as soon as they occur. Responsibility for this maintenance work may rest with the individual mine or property owner.

Division of Conservation.—During the past year an important program was established as regards research on wild life matters. Through a co-operative arrangement between the Ohio State University and the Ohio Division of Conservation, the Franz Theodore Stone Laboratory at Put-in-Bay, which has hitherto operated for three months of the year, will now function as a fisheries research institute, as well as in an academic capacity and will be open throughout the year. Dr. D. M. DeLong, of the Ohio State University, is Director and Dr. T. H. Langlois, of the Ohio Division of Conservation, is Assistant Director.

Research and Administration.—The research activities of the Ohio Division of Conservation were separated from the administrative work. Research is now centralized at Ohio State University, Franz Theodore Stone Laboratory and the Ohio State Museum. The administrative and promotion headquarters are located on the eleventh floor of the Ohio Departments Building.

Fish and game management work were added to the functions of the Division of Conservation.

In 1930 the Ohio Division of Conservation started a program of limnological investigations of its ponds, lakes and reservoirs primarily to determine their suitability for natural propagation, and for stocking hatchery fingerlings and Lake Erie breeder fish.

To date the Division has made preliminary investigations of 57 bodies of water in 50 counties. The card file shows 979 ponds, lakes and reservoirs in 86 of the 88 counties. Of this number approximately 90 per cent are impounded. The impounded waters investigated ranged in size from less than one acre to 16,420 acres and in age from one month to 100 years. Between 500 and 1,000 determinations for temperature, turbidity, oxygen, CO_2 and pH have been made, and a similar number of samples of phytoplankton, zooplankton and bottom organisms identified, counted and tabulated.

The card files and stream maps show 358 old dams out of existence and 388 dams now present. Such old sites are potential places for new dams. The Division's large stream maps show the size of each stream, type of bottom and extent of pollution. Preliminary investigations were made of 19 low dam reservoirs in eight streams and monthly samples are obtained from eight stations in Blacklick Creek. Up to the present time in this stream six dams are completed and one is under construction. At the close of 1936, 110 low dams had been constructed and 15 are now under construction in the state.

Training of Men for Fisheries Work.—The following topic from the Progress Report of the American Fish Policy should be of interest to the Ohio Academy of Science:

"The importance of having well trained men available for fisheries work cannot be over-emphasized The facilities for training in this field are inadequate to meet the present varied requirements. The many divisions and subdivisions of the field and the specific requirements of each must be fully recognized. There must be practical fish culturists and investigators of fish cultural problems, and among the latter some will wish training in the special fields of fish pathology, nutrition, breeding, statistical analysis and fish cultural mechanics.

"We must provide for practical managers of public waters in the interests of sportsmen, commercial fishermen and the broader conservationists and there are plenty of problems here that will require the attention of specially trained investigators.

"The training of professional aquiculturists becomes the responsibility of the colleges and universities.

"Fish culture, aquiculture or limnology covers a broad field. It would therefore appear to be most satisfactory if certain definite aspects of the work were emphasized at each recognized university. As examples of this the University of Wisconsin has developed the physico-chemical and plankton work; Michigan, stream and lake improvement; Toronto, life history and rate of growth of fish; Cornell, stream survey, insect and fish relations and hatchery practice. It is essential that each university deal with all aspects of the general principles underlying aquiculture, and it is just as essential that certain universities accept the responsibility of conducting research with respect to definite problems."

Ohio Wildlife Research Station.—The Ohio Wildlife Research Station

is now in its second year of existence. This is a research organization maintained co-operatively by the Ohio State University, the Ohio Division of Conservation, and the United States Biological Survey. The main offices are located on the Ohio State University campus but much of the work is decentralized at eight substations located at strategic positions in each biological unit of the state. Eight men are now engaged in full time work and a number of students in part time work in connection with the development of a broad conservation program for all wildlife species (both plant and animal). Fourteen major research investigations are now in progress.

The chief objectives are:

1. Basic fact finding necessary for the conservation and development of the wildlife resources of Ohio—*which are worth fifty million dollars per year.*
2. Training of skilled personnel competent to wisely administer these valuable resources.
3. Demonstration and education projects leading to proper appreciation, management and utilization of these resources.

As a part of this new work a preparatory undergraduate curriculum in basic plant and animal sciences and a graduate program for students leading to Master's and Doctor's degrees in Wildlife Conservation Management, are now available at O. S. U. A limited number of fellowships are granted which aid in financing part of these graduate investigations.

The wildlife conservation field involves an integrating of all of the basic botanical and zoological sciences through the ecological approach and the proper land use viewpoints. This conservation and utilization of living organisms is closely knit with out-of-door recreational developments, such as state parks, and, as a conspicuous part of the natural resources, is inseparable from soil and water conservation.

Conservation work phases in progress or completed to date are as follows:

1. Some 35 releases on completed phases of conservation research-education work have been prepared and distributed.
2. Major research problems in progress involve the following species: Hungarian Partridge, Pheasant, Fox Squirrel, Grey Squirrel, Deer, Ruffed Grouse, Cottontail Rabbit, Raccoon, the Ohio breeding species of waterfowl and indirectly nearly all Ohio land vertebrates.
3. A "Manual of Ohio Wildlife Resources" is in preparation which will give qualitative and quantitative information on all wildlife groups found in the state.
4. A number of demonstration wildlife management units of township size have been set up in northwestern Ohio where effectiveness of various "production" and "harvest" techniques are being tested, including exploration of the field of proper adjustment of farmer-sportsmen relationships.
5. A Wildlife-Recreational-Land Use Study of 52,000 acres of state owned forest lands in the unglaciated hills of southern Ohio is now in its third year.

6. Cooperative development with the Ohio Agricultural Extension Service of extension techniques in wildlife management with an extension education program reaching all rural groups, especially 4-H Clubs.
7. The largest library in Ohio on all fields relating to wildlife conservation has been assembled at the Station. Its facilities are now available to the people of the state in addition to assistance and advice on biological-conservation problems. Several thousand pages of technical and educational publications and releases are distributed each month.
8. A cooperative investigation of Ohio wildlife diseases has been initiated in Ohio with three full time and several additional part time investigators cooperating.
9. Ohio initiated a progressive step in 1936 which is already being duplicated in several other states. A series of Conservation Schools were conducted by the Research Station staff. The 175 "graduates" of these schools are now teaching or practicing the new and progressive conservation technique introduced. From these new and progressive conservation technique introduced. From these graduates the Ohio Division of Conservation has selected a nucleus of college trained conservation technicians to develop its new Wildlife Management Division.
10. Research is now being completed on the relationship of streambottoms and streamside border areas of woody plants to wildlife conservation (both fish and land forms), recreation and soil and water conservation. The key importance of these areas is now being recognized. The Ohio Division of Conservation is now engaged in extensive management of these areas including the construction of large numbers of small dams and the obtaining of many miles of easements of streamside strips, which makes these watercourses available for public-conservation use.
11. Special significant research problems now partially completed include population studies of Ohio vertebrates, development of techniques of measuring animal populations and techniques of Conservation education. In connection with this last, a "Primer of Wildlife Management for Ohio" has been prepared and Wildlife Management exhibits created which have already been viewed by more than one hundred thousand residents of the state. More than 60 lectures and several radio lectures on various phases of wildlife conservation have been given during the past year.
12. Seven research stations similar to the one in Ohio are located on a regional basis throughout the United States. For the first time in conservation history, machinery has now been set up through the research stations which brings into close cooperation the large state universities, the state Conservation Departments, and the federal agencies such as the U. S. Biological Survey. For the first time we are utilizing the best man-power and facilities of each in a broad conservation program based on facts, not opinions, but involving the most careful application of scientific data and ecological principles, in modifying the land use program in

the direction of the conservation of our treasured wildlife resources.

Wildlife Research in Southern Ohio.—Major fields of research now include: wildlife land-use, including forestry-wildlife relationships, ecology and management of the gray squirrel, ecology and management of the ruffed grouse, and ecology and management of the white-tailed deer in Ohio. These studies will be combined with others and will be incorporated in a comprehensive report entitled "The Development and Utilization of the Wildlife Resources of the Unglaciated Appalachian Plateau, with special reference to state-owned lands in Scioto County, Ohio."

Continued development of refuges and sanctuaries on state lands in Scioto, Pike and Ross counties. Sanctuaries and refuges in Scioto county now total 10. There are two in Pike county and two in Ross county in addition. Six of these areas are permanent inviolate wildlife sanctuaries. Two are undergoing management at present, one intensively. Two other sanctuaries in Pike and Ross counties were set aside for intensive management, but permission has not yet been given by the Forestry Division, for the initiation of the necessary work.

Odell Creek Sanctuary has been set aside as an example of intensive wildlife management, and numerous demonstrations such as food patches, wildlife plantings, clearings in heavy timber, log check dams, enlargement of waterholes and deer licks, erection of bird houses, and many other features, inaugurated. Nine food patches involving fourteen acres were prepared this spring, and will be planted to corn, lespedeza, alfalfa, rape, sorghum, and later to rye for winter deer feed. Eight acres will be planted to corn.

Five thousand feet of clearings 100 feet wide were made through the dense forested slopes. These are used as study areas, and effects of forest removal on various wildlife species are noted. Complete ecological studies of the whole biotic community are being consummated on cleared, cultivated, and burned areas.

Release cutting to favor better growth and nut production in various species of trees and shrubs, particularly the Hickories, has been started and it is hoped that man power to finish more of this work will be provided by the Division of Conservation, WPA, CCC or other agencies in the near future.

A complete study of the agricultural and forestry practices in vogue in Scioto county at present is being made. This includes effects of burning on brushlands and broom-sedge meadows and relation to wildlife, effects of late plowing, roadside mowing, kinds of crops grown, interspersion of vegetation types, forest stand improvement, protection of forests against fire, plantings of conifers in large blocks, selective cutting of timber, etc., etc. Wildlife habitats of western Scioto county are being mapped after the method used by Saunders in "Ecology of Birds of Quaker Run Valley," with modifications.

A small nursery in which wildlife food and cover plants are being propagated was begun in 1936. At present there are 3000 norway spruce seedlings, 600 black and honey locust, and about 1000 bird-cherry seedlings on hand. Thirty beds four feet wide and 84 feet long

make up the nursery. Maintenance of the nursery has been carried on by a man furnished by the Conservation Division. Approximately 35 species of plants are being propagated here, and there will be at least 10,000 or 20,000 seedlings on hand by autumn, 1937, if weather conditions are favorable.

The value to wildlife of old apple trees still remaining on the Preserve and Forests has been recognized, and many of these trees have been pruned (without destroying nesting cavities of bluebirds, etc.) in order to increase fruit production. These trees are valuable to deer, grouse, rabbits, bluebird, crested flycatcher and other forms of wildlife.

Bluebird Boxes.—Your chairman was instrumental during the past year in carrying out an interesting little experiment looking toward the restoration of our bluebird population in the visinity of Columbus.

With the continued dwindling of our woodlots, the passing of the old rail fences, and finally, the replacing of wooden fence posts with concrete and steel posts, the bluebirds have steadily decreased in numbers. Since these birds feed largely on cutworms, grasshoppers and other destructive insects, they are valuable assets to the agriculturist, while their esthetic value to the community is unquestioned.

By a cooperative arrangement between the Columbus Audubon Society and the Ohio State Museum 100 substantial bird boxes were constructed and erected in the vicinity of Columbus. The results exceeded our fondest hopes. The great majority of the boxes were occupied by bluebirds and the great majority of these successfully raised one or more broods of young. The experiment indicates that our bluebird population can easily be restored in many places by providing suitable nesting sites.

New Conservation Organizations.—Your committee notes during the year the formation of two organizations which are potential forces for the good of conservation. The League of Ohio Nature Clubs is composed of 22 nature societies of various kinds in every quarter of the State. The Natural Resources Council is a national organization in which any group interested in any aspect of conservation is eligible to membership. It is composed of county councils, which elect representatives to a state council, which in turn selects representatives to the national council.

Recommendations.—Your committee approves of the objects and the activities of the Save Outdoor Ohio Council and of the participation of the Ohio Academy of Science in it.

Your committee notes with satisfaction an apparent reduction in activity of organizations in various parts of the state in pest hunts and "vermin killing campaigns." We reiterate our firm conviction that organized pest hunts are uneconomic and contrary to the principles of conservation. Such campaigns are objectionable, first, because they encourage the carrying of firearms during the closed season by undisciplined, often irresponsible persons, making enforcement of our game laws difficult or impossible. Secondly, each pest hunter makes himself a judge of what constitutes a "pest." The economic status of our wildlife is a matter requiring the most exhaustive and careful research. Scientists are well aware of the complexity of the question but few pest hunters have the remotest idea of the problems involved. Pest hunts

invariably result in the destruction of many species beneficial to mankind and of many song birds and other animals which are protected by law.

Your committee deprecates the widespread use of miscellaneous poisons by Federal, State and private agencies in efforts to reduce the numbers of certain wild animals.

There is ample biological evidence that the maintenance of a normal mammal population, in relation to its environment, in natural balance, is conducive to the economic benefit of mankind.

The programs of soil conservation, flood control and range improvement, among others, would seem to require for their successful consummation the maintenance, in the problem areas, of a normal native mammal population.

There has been in recent years an enormous expansion in the volume of poison distributed in the United States to control mammals, primarily because of the availability of the personnel of the CCC as distribution agents; therefore your committee recommends and asks that:

1. The practice of poisoning native wild mammals by Federal and State agencies be discontinued except where thickly settled communities may be demonstrated to be in danger of a plague epidemic affecting the mammal population of the area.
2. That private agencies be discouraged in the use of poison as a control medium and that the practice of control by such agencies be limited to areas which are under cultivation, including a reasonable but limited buffer zone.
3. That Federal and State agencies be urged to initiate comprehensive research programs to determine all obtainable facts concerning the relationship of the rodents and predatory animals to the soil, vegetation and the use of the land by man.

Your committee recommends to the consideration of the universities of the state the establishment of a curriculum for the training of men in fish culture, fisheries management and fisheries biology.

Your committee recommends that adequate protection be provided for the sanctuary areas in Scioto County.

Your committee recommends that suitable legislation be initiated and enacted to prevent the devastation caused by strip mining.

We continue urgently to recommend the acquisition by the state of relict communities which are threatened with destruction, and refer particularly to those unique areas, the arbor vitae bog in Champaign County and the oak openings west of Toledo.

Respectfully submitted,

Herbert Osborn, Arthur T. Evans,
Wilber E. Stout, L. E. Hicks,
G. W. Conrey, Edmund Secrest,
E. L. Wickliff, Emery R. Hayhurst,
Edward S. Thomas, *Chairman.*

Report of the Save Outdoor Ohio Council

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

A year ago it was possible to report that the Save Outdoor Ohio Council had made progress in co-ordinating efforts in the many aspects of wild life conservation and applying some of these to public instruction. This work is bearing fruit in several lines. This year activity has centered around our State Parks. Briefly we have in Ohio three types of State Parks—Memorial or Historical Parks, Recreational Parks, and Scenic Parks. For some time a question has been in the minds of the Save Outdoor Ohio Council concerning the methods by which these parks might become in part self-supporting. I need not go into details about examples of well run recreational parks in other states, nor the conspicuous success of a privately owned park, the Blue Hole at Castalia Springs. The committee, among whom were our State Forester, Mr. Edmund Secrest, the Director of the Archaeological Museum, Mr. Henry Shetrone, the President of the Sportsmen's League, Mr. Tudor Wilson, the Conservation Commissioner, Mr. Earl Wooddell, Captain Maury, of the Hotels association, Mr. Walton Bliss, of the Ohio Education Association, Mr. Roscoe Franks, of the Save Outdoor Ohio Council, Mr. Walter Tucker, representing the Garden Clubs and the Press and a representative of the Ohio Academy of Science, met with the Finance Committee of the Legislature. The result was an appropriation for a swimming pool near Fort Hill and the understanding that income derived from one park would be applicable to others. It may be possible to see tangible results of this rather shortly. It is hoped that if the way might be made clear that the parks would become self-supporting, that additional purchases would be made of natural sites that could not otherwise be saved from extinction. Two places that should be specifically mentioned are Cedar Swamp, near Urbana, and Fern Lake, in Geauga County. Even if these two purchases do not materialize, there are definite benefits from the idea of unification of our State Parks into a general system. For example, if the State Finance Committee can see the possibility of some income, they might be moved to add a tract of forest land of 660 acres near Fort Hill. This would give the state its first forest sanctuary in that part of Ohio. For it should be remembered that under the existing laws the only direct purchase of sites by the forestry department are tracts of land in which the average price does not exceed five dollars per acre. The areas of the state with fertile soils are excluded from purchase. Under a unification plan sections of a park could be administered from different objectives. The Fort Hill Memorial at the top of a hill will not be interfered with by those who come to the park for the recreation of swimming. A forest area could belong to the park, if the funds became available from the park, and that forest remain a wild life sanctuary.

It is the purpose of this report to show you that your interest and support of the Save Outdoor Ohio Council has helped to make it an effective liason organization. We should not overlook the fact that

this Council's beginnings were largely the outgrowth of the enthusiasm of one public spirited citizen, Mrs. George MacDonald, of Wyoming, Ohio.

If the Academy is favorable, I should like to propose that it endorse two activities:

(1) A nominal admission to certain State Parks.

(2) The purchase of the Cedar Swamp and Fern Lake areas.

Respectfully submitted,

A. E. WALLER,
Representative of the Academy on the Council.

Report of the Committee on the Election of Fellows

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

The Committee on the Election of Fellows met last evening at the Deshler-Wallick Hotel, Columbus, Ohio, and elected the following persons to fellowship in the Ohio Academy of Science, viz.:

E. T. BODENBERG
RALPH ORLANDO FREELAND
CHARLES CLIFFORD HUNTINGTON
BIRELY J. LANDIS
THOMAS HUXLEY LANGLOIS
HORATIO C. MASON
FLOYD A. MCCLURE
LOUIS A. PAPPENHAGEN
EDWARD WALDO EMERSON SCHEAR
JOHN L. RICH
RALPH GEORGE SCHOTT
EDWARD S. THOMAS
BRUCE K. WISEMAN

Respectfully,

WM. H. ALEXANDER,
Secretary.

Report of the Trustees of the Research Fund

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

There has been little change in the research fund during the past year, but one grant of $75.00 to Prof. J. P. Porter, of Ohio University, has been made. The statement for the fiscal year ending December 31st, 1936, as submitted for audit is as follows:

RECEIPTS

Balance on Hand December 31, 1935	$185.77
Received from Interest and Dividends	66.75
Total	$252.52

DISBURSEMENTS

By Grant for Research Project—J. P. Porter	$ 75.00
Service Charges, Ohio National Bank	.50
Balance on Hand—Checking Account, Ohio National Bank	177.02
Total	$252.52

There have been no changes in the invested funds during the year.

Bonds at Face	$1,300.00
Stock, Ohio National Bank, at Cost	437.50
Total Invested	$1,737.50
Balance in Checking Account, Ohio National Bank	177.02
Total Resources	$1,914.52

The trustees will be glad to receive requests for grants at an early date as it will facilitate the allotment of funds for the current year.

Respectfully submitted,

HERBERT OSBORN,
GEORGE D. HUBBARD,
WM. LLOYD EVANS,
Trustees.

Report of the Membership Committee

May 14, 1937.

To the Ohio Academy of Science:

We, your Committee on Membership, recommend the election of the following persons, whose nominations are in due form and whose dues for one year have been paid, to membership in the Ohio Academy of Science, viz.:

BAKER, R. C., (D), Ohio State University, Columbus.
BENNINGTON, NEVILLE, (A), 1114 North Bever, Wooster.
BINGHAM, MRS. HARVEY C., (B), Bentleyville Rd., Chagrin Falls.
BOORD, DR. CECIL E., (H), Chemistry Department, O. S. U., Columbus.
BOSWORTH, ALFRED W., (D), 381 W. Tenth Ave., Columbus.
BOYD, MILFORD JOHN, (D), 2347 Fairview Ave., Cincinnati.
BRIDGMAN, CATHERINE M. (B), R. F. D. No. 1, Ellsworth.
CARLSON, FRED A., (G), 171 Oakland Park Ave., Columbus.
COOPER, JOHN R., (C), Mount Union College, Alliance.
DAKAN, E. L., (A), Ohio State University, Columbus.
DICKERMAN, E. EUGENE, (B and A), State Normal, Bowling Green.
FEDERIGHI, HENRY, (Biology), Antioch College, Yellow Springs.
GEBHART, JAMES W., (A), 4926 Donald Ave., South Euclid.
GLENNY, FRED H., (B), 1148 Linden Ave., Akron.
GROVE, BERT E., (C), 8045 Vernon Ave., Chicago, Ill.
HAMILTON, M. J. (C and A), 1753 Kensington Ave., Youngstown.
HUDSON, DR. N. PAUL, (D), Ohio State University, Columbus.
JOSEPH, SISTER MARY, S.N.D., (Biol. and Chem.), Notre Dame College, South Euclid.
KITCHIN, DR. PAUL C., (D), College of Dentistry, O. S. U., Columbus.
LEEDY, DANIEL L., (A), Ohio State University, Columbus.
LEWIS, ANNETTE L., (E), 356 Cliffside Drive, Columbus.
MILLER, FREEMAN D., (F), 308 N. Pearl St., Granville.
MOORE, CARL V., (D and H), 1290 Primrose Pl., Columbus.
PALMER, DWIGHT M., (D), Dept. of Anatomy, O. S. U., Columbus.
PUTERBAUGH, M. P., (?), Ashland College, Ashland.
QUILL, LAURENCE L., (H, F, and C), Dept. of Chemistry, O. S. U., Columbus.
ROCKWOOD, RUTH C., (G), La Grange.
ROUSE, JOHN T., (C), Orton Hall, O. S. U., Columbus.
SHELLHAAS, MARK A., (A), 241 N. Main St., West Milton.
SUDLOW, PAUL L. (B and A), Rio Grande College, Rio Grande.

Toomex, Dr. John A., (D), City Hospital, Cleveland.
Tucker, Walter A., (B), 728 S. Remington Rd., Columbus.
Urban, Sister Mary, O. P. (B, A, and H), St. Mary of the Springs, Columbus.
Venard, Carl, (A), Ohio State University, Columbus.
Wallace, S. R., Jr., (E), 404 University Hall, Columbus.
Wilson, Mrs. James Watson, (Biol.), Muskingum College, New Concord.
Winter, A. R., (Biol.), Ohio State University, Columbus.
Wiseman, Dr. Bruce K., (D), Kinsman Hall, O. S. U., Columbus.
Yates, Paul B., (D), Dept. of Anatomy, O. S. U., Columbus.

Respectfully submitted,

K. G. A. Busch, *Chairman*,
Eugene Van Cleef,
Samuel Allen.

Report of the Nominating Committee

For President.....Charles G. Shatzer
For Vice-Presidents—
A. Zoology.....Warren Spencer
B. Botany.....Raymond A. Dobbins
C. Geology.....John L. Rich
D. Medical Sciences.....Bruce K. Wiseman
E. Psychology.....Harold E. Burtt
F. Physics and Astronomy.....Dayton C. Miller
G. Geography.....Frank J. Wright
H. Chemistry.....W. Conrad Fernelius
For Secretary.....William H. Alexander
For Treasurer.....Eugene Van Cleef
For Executive Committee.....Charles A. Doan, A. W. Lindsey
For Trustee, Research Fund.....James P. Porter
For Administrative Board.....Edward L. Rice
For Publications Committee.....Edward L. Rice, F. C. Dockeray, Grace Ann Stewart
For Library Committee.....L. B. Walton
For Committee on Conservation.....F. H. Krecker, Edward S. Thomas, W. E. Stout
For Representative on Save Outdoor Ohio Council....A. E. Waller

Respectfully submitted,

Guy-Harold Smith, *Chairman*,
D. F. Miller,
Glenn W. Blaydes,
Grace A. Stewart,
Charles A. Doan,
James R. Patrick,
K. G. Busch,

Report of the Committee on Necrology

COLUMBUS, OHIO, May 14, 1937.

To the Ohio Academy of Science:

The Academy has suffered the loss of three active and valuable members during the past year—Dr. August Frederick Foerste, Prof. Jesse Earl Hyde, and Dr. Richard Collins Lord. To this list there must be added also the name of Mr. George P. Harmount, who died in April, 1935. Following are records of work of these members.

Respectfully submitted,

E. N. TRANSEAU,
RAYMOND C. OSBURN, *Chairman,*
Committee.

AUGUST FREDERICK FOERSTE, born at Dayton, Ohio, May 7, 1862. Denison University A. B., 1887; Harvard University Ph. D., 1890; student at Heidelberg and Paris, 1890–1892; awarded an honorary D. Sc. by Denison, 1927. Died April 23, 1937. Dr. Feorste spent nearly all of his life in Ohio and was a teacher in the Steele High School at Dayton from 1893 until he retired in 1932. After his retirement he was associated with the U. S. National Museum, carrying on his studies on the Ordovician and Silurian fossils. He was an excellent all-round naturalist and a splendid teacher. He was one of the early members of the Ohio Academy of Science, elected a member in 1898 and advanced to fellowship in 1920. He was a very regular attendant and contributor at the meetings of the Academy.

JESSE EARL HYDE, born at Rushville, Ohio, May 2, 1884, died July 3, 1936. He graduated at Ohio State University in 1906, specializing in Geology and pursued further studies at Harvard and Columbia Universities. He was Assistant Professor of Geology in Queens University, Kingston, Ontario, from 1911 to 1915, when he was called to Western Reserve University. He was also connected with the Cleveland Museum of Natural History as Curator of Geology from 1922 until 1931, when he was compelled to drop the latter connection because of the condition of his health. He spent many summers in research for the Ohio Geological Survey. He was especially interested in the Devonian fishes of the Cleveland shales, and the Cleveland Museum possesses a remarkable collection as the result of Prof. Hyde's efforts. He was a man of unusual energy and a very strong sense of duty. He became a member of the Ohio Academy in 1905, while still an undergraduate and was elected to fellowship in 1920.

RICHARD COLLINS LORD, born January 4, 1882, at Covington, Kentucky. He was a graduate of Washington and Lee University in 1901, Ph. D. in 1904. He was interested in Chemistry and Geology and did excellent work in both fields. From 1904 until 1922, he was engaged in commercial chemistry. In 1922 he was appointed Assistant Professor of Chemistry at Kenyon College and in 1928 was made Professor of Geology, which position he held until the time of his death, November 1, 1936. Professor Lord became a member of the Ohio Academy of Sciences in 1925.

George P. Harmount. The Committee has been able to obtain but very little information concerning Mr. Harmount. He was graduated from Ohio State University in 1911, with the degree of Bachelor of Education and received the Master's degree in 1912. He was a teacher in the Columbus schools and in 1915 became a member of the Academy of Sciences, with his interests in Geology and Archaeology.

Report of the Committee on Resolutions

Columbus, Ohio, May 14, 1937.

To the Ohio Academy of Science:

Resolution No. 1

Whereas, The Finance Committee of the Legislature has appropriated the sum of $47,500 for the purpose of constructing swimming pools and other recreational facilities in a few State Parks; and

Whereas, It seems desirable that State Parks provided with such special recreational facilities be made at least partially self-supporting, thereby liberating funds for the purchase of additional lands to be set aside as State Parks;

Be it Resolved, That the Ohio Academy of Science recommends the charging of a nominal admission to such State Parks.

Resolution No. 2

Whereas, Funds will become available for the purchase of additional State Parks, if the plan recommended in the first resolution is adopted; and

Whereas, Certain areas in the State now facing extinction need preservation more urgently than others:

Be it Resolved, That the Ohio Academy of Science recommends the early purchase of the following two sites, viz.:

(1) Cedar Swamp, near Urbana, Ohio.

(2) Fern Lake Area, Geauga County, Ohio.

Respectfully submitted by the Resolutions Committee,

H. H. M. Bowman, *Chairman*,
Walter H. Bucher.

PRESIDENTIAL ADDRESS*

MODERN MEDICINE—THE CROSSROADS OF THE SOCIAL AND THE PHYSICAL SCIENCES

CHARLES AUSTIN DOAN, B. S., M. D., F. A. C. P.

In acknowledging the honor you have done the Section on Medical Sciences in permitting one of its members to serve as your President during the past year, may I say first of all that we interpret your action as a recognition of the emergence of medical practice from an ancient and honorable Art into a modern, dynamic Science of Health. Disease has existed on the earth as long as organic life has been known. The archeologist, the geologist, the anthropologist, the explorer, have all contributed affirmative evidence of this belief. The earliest interpretable record dates back some four and a half million years according to the accepted geological calculation of time, and represents a form of parasitism—fossil snails in the act of feeding on crinoids, a species of sea lily. From that time on, as the fossil remains of the earth's earliest inhabitants unfold the story of life before the advent of man, there appears mute evidence of disease as revealed by skeletal abnormalities—fractures, carious teeth, bone necroses—in the now extinct fishes and reptiles. The tsetse fly, today's deadly carrier of cattle plague and African sleeping sickness, has been identified in fossil formations dating back a million and a half years.

Man's arrival on the scene seems to have been greeted by the same onslaught of disease that met the various forms of plant and animal life which preceded him. The "Java man," placed by anthropologists as the precursor of the human race with an estimated age of 500,000 years, shows pathological exotoses of the femur. The "Piltdown man," with an estimated age of 100,000 years and considered the oldest human skeleton yet discovered, has an acromegalic skull. The "Neanderthal man," spanning 75,000 years of elapsed time, has suggested rickets to some anthropologists.

The history and scientific beginnings of medicine extend back to the ancient Egyptians of the very first civilization of which we have written record, some thirty centuries before the rise of the better known Hippocratic school at Cos in Greece. The Smith Surgical Papyrus and the Ebers Medical Papyrus, ancient hieroglyphic records of the diagnosis and treatment of disease as practiced some 3500 years B. C., carry recognizable descriptions of many diseases prevalent in the modern day world. The observations of the beloved late Prof. Elliott Smith, who by 1930 had examined the remains of some 30,000 ancient Egyptians and Nubians representing every period of the last 60 centuries, and the microscopic studies by the late Marc Armand Ruffer of carefully restored and sectioned mummified tissues, each independently bear direct testimony to the diversity and similarity of human pathologic processes, then and now.

*Delivered before the Ohio Academy of Science, May, 14, 1937.

Thus, from time immemorial man has dreamed and speculated and philosophized about the nature and the significance of life, and has shuddered and shrunk and fled from famine and war and pestilence. This amazing world in each succeeding epoch has presented an ever increasing variety of problems, which have challenged the best minds of each age. At the very extreme of complexity, and the last to be satisfactorily approached for solution on a rational scientific basis have been the problems of human health and disease. The true physician has ever stood at the crossroads, receiving the slowly and painfully accumulated facts from any and every scientific source, and has then appropriated, reinterpreted and applied them in the alleviation of human misery and suffering. As a result, like the shedding of a chrysalis, the basis for health was transformed at the turn of the century from a speculative, descriptive, cumbersome classification *of* disease to an exact experimental science for the accumulation of verifiable facts *about* disease. Today, we are seeing the natural result of this metamorphosis in method and technic, derived from the basic natural sciences, in a transfer of the major emphasis in medicine from empiricism to mechanism—from the "cure" of disease to the "prevention" of disease. One by one superstitions based upon error, or upon incomplete knowledge, are giving way to more exact methods of procedure, until we may envisage the composite, Ideal Physician of the future as embodying an appreciation and a working knowledge of all of the intricacies of fact deriving from the social as well as from the physical sciences.

If there is any lesson which we of this era should have learned from the past it is the basic necessity for co-operative effort. If the common problems which civilized man faces today are to be solved successfully, the co-operative intelligence of many minds, wherever existing, irrespective of race, color, creed or narrow sectarian viewpoint, must be focused sharply upon them. Peace—progress—our very existence are seriously threatened through failure to fully appreciate the universality of this fundamental principle—applied economically, socially and politically, as well as scientifically. Medical leadership in recent years has perhaps recognized this challenge more clearly, and realized its *sine qua non* for survival more fully, than many in other walks of life. Epidemic disease is no respecter of geographic and racial boundaries, or of economic, political and social differences, and medical science has had to look to and embrace the intellects capable of solving its problems wherever they have appeared on the face of the earth. Moreover, medical leaders everywhere co-operate in an international health cordon for the dissemination and application of this knowledge, as it becomes available. With transportation and intercommunication in the world today, such that a yellow fever carrying mosquito in an airplane wing on the west coast of Africa this morning, may tomorrow be either in continental Europe or South America, and mayhap the next day on our own eastern seaboard, one cannot evade the reality of the imminence of invasion by disease, even though there be some difference of opinion as to the immediate significance of such feats, with reference to other more obvious forms of invasion.

We may agree, perhaps, then that one of the most important func-

tions being subserved by medical science in the present day is its exemplification of the necessity for, and its demonstration of the ways and means of organization and administration toward, co-operative effort *within* the nation and *between* nations. I need only cite the White House Conference on Child Health and Protection during President Hoover's administration, which resulted in the pooling and critical analysis of our scant information in this basic field and the defining of objectives, which since have been methodically and intelligently and co-operatively pursued; *or* the activities during the past decade under the Research Committee of the National Tuberculosis Association, which has integrated and correlated the research programs in some fourteen Universities, three research institutes and two large pharmaceutical firms, directed toward the better understanding and control, by treatment and prevention, of this great white plague; *or* the diversified activities and integrating functions of the National Research Council and the A. A. A. S., of which this Ohio Academy of Science is a worthy satelite, for the cross fertilization of scientific ideas in the broadest sense; *or* the nation-wide programs for venereal disease and cancer control which are being inaugurated at the present time in this country after the successful mass application of present medical knowledge to these identical problems of disease in Britain and the Scandinavian countries; *or* the American, British, and League of Nations co-operating committees on the study and control of chronic arthritis, representing a group of crippling, painful, and economically hazardous diseases, which are increasingly challenging the health and happiness of civilized peoples; *or* the first international conference on fever therapy held in New York City last month with official representatives from the Ministries of Health of 16 countries; *or* the International Physiological Congress meeting in Boston two years ago, and the International Association of Geographic Pathology meeting in Stockholm this summer with "anemia" as it affects different people in different parts of the world, the topic for discussion for the entire meeting; *or*, finally, the International Health Board under the Rockefeller Foundation, which through the years has led in the encouragement of the development and exchange of men and ideas in matters relating to world health problems.

It may not be too late to hope, or too egotistical or remote for scientific groups, such as this Academy represents, to believe, that many, if not all, of our present seemingly insurmountable economic and social problems would yield more readily and happily to human ingenuity and intelligence, if our leaders and their respective followers were alike endowed with a larger share of their rightful heritage of normal mental and physical health. To that end all such gatherings as the present one contribute more or less directly, and when and if, and not until, the ideal integration of a genetically sound psyche with an optimum somatic and environmental background has been accomplished, will the essential keystone to the arch of human relationships have been provided. "The promise of things hoped for, the essence of things yet unseen," implied in the present material accomplishments of the human race, are alluring to contemplate but impossible to fully prophesy.

The experience of the past half century, during which the spectacular

acquisition and practical utilization of knowledge appertaining to the basic organization and reactions of matter has been paralleled by an equally active exploration of the form, composition and functions of living cells and organisms, provides an increasing number of instances in which the two approaches have interacted to the mutual advantage of each. Studies of the applicability of x-rays to the problems of medicine were begun within a few months after the announcement of their discovery by the physicist Roentgen. Radium and radioactive substances have likewise been appropriated by physicians as rapidly as isolated and concentrated in needles and bombs for therapeutic purposes. Deuterium had hardly been isolated by Urey and confirmed by Johnson and other chemists until its biological significance was being explored, even before all of its chemical properties were known. The high frequency, short wave radio field was no sooner found to be the source of discomfort to men working within its immediate vicinity because of the production of fever and malaise, than Whitney of the General Electric Company recognized its potential therapeutic significance and at once enlisted the aid of physicians and bacteriologists and placed the resources of his laboratories at their disposal in the development of this approach to fever therapy. Kettering of the General Motors Research Laboratories followed promptly, designating himself a technical collaborator with the medical investigators in applying modern engineering methods to developing and adapting new apparatus for experimentation and therapy. Last week a headline in the *New York Times*, reporting the meetings of the American Physical Society read: "Progress is made in 'taming' neutron." The next subheading in capital letters only a little less prominent, read: "Physicists are told of Columbia work bringing nearer a powerful aid for Medicine." The x-ray, the gamma rays of radium, the high frequency current and now the cyclotron. The physicist, the electrical engineer and the physician have formed a liason in which each is mutually dependent upon the other. Just as the biologist has been directing the chemist as to which fractions were biologically "active" or physiologically significant—and therefore most important to analyze and synthesize in terms of human health, so the comparative value of the different physical agents developed in the physical laboratories is being appraised and evaluated by the medical investigator as rapidly as evolved. The artificial induction of therapeutic fever by various physical means was inevitable after von Jauregg observed in his Vienna Sanatarium that general paralysis of the insane frequently improved following an intercurrent febrile infection; and, *then*, had the courage of his convictions, sufficiently, to induce fever reactions by inoculating selected patients under his care with the malaria plasmodium. Keenness of observation was thus followed by inductive reasoning, the test of therapy was successfully applied, and, finally, the bacteriological, cellular and humoral mechanisms by which improvement is accomplished are just now becoming clear. It is of peculiar interest and significance that the first effective treatment for syphilis of the central nervous system was dependent upon the introduction of another disease, malaria, which through the years, until Ross, McCallum, et al. discovered its cause

and control, had been one of man's worst enemies, and still is in some parts of the world. The ingenuity of the physician is exemplified at its best in such an instance, where in discovering how to conquer one disease, he learned enough to make it his servant in conquering still another scourge of mankind. With the demonstration of the thermolability of the treponema pallidum and of the gonococcus at human fever temperatures the importance of fever *per se* in these diseases has been emphasized and the development of physical means for the induction of fever followed naturally and inevitably.

Another example of shrewd inductive reasoning based upon keen observation by a prepared medical mind occurred during the world war. Baer, an orthopedic surgeon with the American Expeditionary Forces, noted that injured soldiers evacuated some hours after severe injury and with wounds teeming with fly larvae, were less frequently found in profound shock and seemed to have a less stormy convalescence, then men with similar but uninfested wounds. After a decade of pondering this observed fact, during which time children with infected and crippling bone lesions returned to him constantly with recurrences and metastatic disseminations despite the most careful application of modern medical and surgical measures, *he* developed the courage of *his* convictions. Soliciting the aid of David Miller and other zoologists with an intimate knowledge of the life cycle of the maggot, methods for the reproduction of fly larvae under sterile precautions were developed. In the beginning, some enzyme or chemically active secretion was hypothesized as the active principle; and, now, allantoin has been identified by the chemists as the effective substance and is replacing the original less esthetic maggot treatment of mother Nature and the observant surgeon.

Whipple, while studying the comparative value of different foods in the regeneration of hemoglobin in dogs following hemorrhage, discovered that liver was invariably most effective. Minot and Murphy, knowing of these experiments, then, observed that liver fed in sufficient quantities to human patients with pernicious anemia resulted in a prompt and sustained remission. Chemists promptly fractionated liver, and many other tissues, with the eventual isolation of the active erythrocyte maturation principle in a purified and simplified solution suitable for parenteral administration, thus saving the lives of many sufferers from this disease who would rather have died than eat a pound of liver daily for the remainder of their lives. Only later came the keen analysis of Castle, which firmly established pernicious anemia as a deficiency disease dependent upon the exhaustion of an essential hormone in the stomach, and demonstrated that the erythrocyte maturation factor stored in the liver, normally, is the resultant of the interaction of the gastric hormone known as the "intrinsic factor" with an essential dietary or "extrinsic factor" contained in animal protein.

One of the great modern advances in the science of medicine has been the realization that all disease is not necessarily the result of some external circumstance or bacterial invasion, and that there is a distinction between "optimum" health and "apparent" health, i. e.,

between good, better and best. Vitamine and endocrine researches in recent years have done most to exemplify the potential threat to health and well being of deficiency in these vital elements. The chemist and the physician here combine their resources again in the fundamental problems which underlie the deficiency states. Night blindness, ophthalmia, pyorrhea alveolaris and urinary calculi suggest vitamin A insufficiency. Polyneuritis follows a vitamin B-1 deficiency, and pellagra with dermatitis, pigmentation of the skin, glossitis, stomatitis and at times mental disturbances may be symptomatic of vitamin B-2 complex deficiency. Easy bruising, oozing of the gums or unexplained oedema may reflect a vitamin C inadequacy, and rickets and dental caries have largely disappeared where adequate vitamin D is available in the body economy. A lack of calcium may lead to hyperirritability of the neuro-muscular mechanism, tetany. A deficiency in iron leads to hypochromic anemia, and, if iodine is not available, the thyroid gland suffers. In this connection it is important to remember that interference with *absorption* or *utilization* of essential specific principles may be quite as significant in producing symptoms as their absence from the diet.

Also a new principle in disease has been recognized very recently through the increasing knowledge of the interdependence and interaction of vital physiologic functions between widely separated and apparently unrelated organs. If the function of one is impaired the normal function of the other may lead to premature or untimely invalidism or death. As examples, may be cited the removal of the normal thyroid gland to recompensate the damaged heart—or the elimination of the spleen in selected instances where it acts to inhibit or make less effective the production of blood cells by the bone marrow.

One of the most fascinating fields for speculation and further investigation at the present moment lies with the ultramicroscopic viruses. Since the original demonstration of the infectious properties of filter passing sera from which neither aerobic nor anaerobic bacteria could be cultivated, the question of the ultimate nature of these agents has been warmly debated. Do they represent minute living and propagating protoplasmic bodies or are they more nearly comparable to chemical hormones or enzymes? Within the past few months Stanley, Plant Pathologist at the Rockefeller Institute, Princeton, has reported the isolation, purification and chemical crystallization of the agent which produces mosaic disease in the tobacco plant. Thus, the possibility of an entirely new set of biological phenomena related to complex chemical molecules is suggested, and the differential criteria separating animate and inanimate molecular structures are reduced almost to the vanishing point. Many of the workers in this field at the present time while accepting the non-viable nature of tobacco mosaic virus, still believe that other of the viruses may be the earliest and most primitive forms of living matter. Chemistry and biology must therefore, again function together as handmaidens to pathology.

The plant and the animal pathologist often serve as pioneers in exploring territories in which diseases common also to man exist. Laidlaw's investigations of distemper in dogs and his development

of an immune vaccine and therapeutic serum, have given fresh impetus and direction to the search for an effective control of the common cold in man. And Shope's study of the swine influenza which appeared in 1918, coincident with the world-wide spread of human influenza, identified a common etiology for the two diseases through common immunologic reactions. Shope found, however, that in swine it required *both* a filterable virus and a bacterium closely similar to, if not identical with, the Pfeiffer or influenza bacillus to cause the disease, a principle similar to one originally postulated by David Smith for lung abscess.

But the devotees of both the social and the natural sciences are facing still another problem of increasing significance and major importance today. Whereas famine and war and pestilence have acted jointly, and frequently coincidently, in the past in the rôle of Lord High Executioner for the race, and mediators of the law of the "survival of the fittest," it is no longer the physical so much as the social and economic forces attendant upon the transition from a slow-tempo agrarian to a high-tempo industrial civilization, which are picking out the constitutionally unfit and eliminating the psychobiologically inferior. The American disease, as Emerson, Bateman and others have designated it, challenges the best effort and skill of the modern physician and social worker. This disease camouflages under numerous and varied symptomatologies, but the common denominator of them all is the highly altered tension under which life is lived today, as contrasted with a few decades ago. The human body is a delicately adjusted, exceedingly complex mechanism with very definite limitations which vary constitutionally from individual to individual. The psyche is more important to its proper functioning than many of the organic processes which have received such careful and detailed study in the past. The central nervous system of man by the very nature of its integrating, governing and association functions reflects this crowning achievement in organic evolution on the earth today. The material creations of this collective brain, nevertheless, are not being "intelligently" directed and mastered and kept servile to objectives and ends, which would be for the best interests of the race as a whole. Annihilation awaits those who either individually or collectively fail to recognize the "handwriting on the wall." The social and natural sciences must together advance even more clearly and definitely into this domain of modern life and, with increasing factual data upon which to base judgments, make certain that a leadership fully conscious of the lurking dangers as well as the potential possibilities directs our destinies.

Claude Bernard, one of the great physiologists of all time, had rare insight into the dominating motivation of those men of science he designated as the Truth Seekers: "Ardent desire for knowledge, and this knowledge really grasped, and yet always flying before them, becomes at once their sole torment and sole happiness. Those who do not know the torment of the unknown cannot have the joy of discovery, which is certainly the liveliest that the mind of man can ever feel. But, by a whim of Nature, the joy of discovery, so sought and hoped for, vanishes as soon as found. It is but a flash, whose gleam discovers for us fresh horizons toward which our insatiate curiosity repairs with

still more ardor. Thus, even in science itself, the known loses its attraction, while the unknown is always full of charm." Or as Pascal put it: "We are in search never of things but of the search for things."

The Section of Medical Sciences in the Ohio Academy of Science salutes you, the underlying, fundamental Sciences from which are synthesized new and more effective and essential answers to these problems of individual and community health. We acknowledge gratefully the past contributions upon which medical progress has been built, and solicit a continuing, ever more intimate and productive liason, in the best interests of—let us hope—a *rising* and not a *waning* civilization.

GRANTS IN AID OF RESEARCH

The Ohio Academy of Science has available a limited amount of funds to allot in aid of research projects. Applications for such aid should give a statement of the project, an estimate of expenses, and indication of time involved. Payments on grants may be made on submission of a statement of expenditures incurred and results secured. On publication acknowledgment should be made of source of grant. Address application or enquiries to chairman of Trustees, Research Fund, Herbert Osborn, Ohio State University, Columbus, Ohio.

LEECHES OF SOUTHEASTERN MISSOURI

MARVIN C. MEYER,
Ohio State University, Columbus, Ohio

The leeches upon which this paper is based were collected from April to November, inclusive, of 1935, and April, May, June and July of 1936, from southeastern Missouri. This area includes the following counties: Perry, Madison, Wayne, Bollinger, Cape Girardeau, Scott, Mississippi, New Madrid, Dunklin, Butler, Stoddard and Pemiscot. The highest altitude, of about 1,500 feet, is in Wayne and Madison Counties. From here to the extreme southeastern part of the state are the lowlands and swampy areas, the altitude being 250 feet or less. On the east is the Mississippi River into which the four rivers and many smaller tributaries empty.

Because of the essential flatness and swampy condition in Scott, Butler, Stoddard, Mississippi, New Madrid, Dunklin and Pemiscot Counties, which constitutes about 60 per cent of the area, this section has been artificially ditched, resulting in numerous streams in addition to the many natural creeks and smaller brooks.

Heretofore, reports on collections of leeches have been limited chiefly to the waters of the northern and northeastern part of the United States, in the Great Lakes Region, and Canada.

The writer identified a total of fifteen species in his collection. This number compares very favorably with the numbers reported in other works and appears to indicate an abundant leech fauna for the section of the state covered in this report.

The leeches were obtained by examining submerged organic debris, the under side of stones, leaves, wood, clam shells, water plants, fish and turtles, and in the mud and ooze on the bottom of the streams and ponds. In one instance, *Haemopis lateralis* was found a few inches below the soil surface in soil which was sufficiently dry to be plowed. However, the presence of this leech in this habitat is not unusual.

The writer found only one record of leeches reported for Missouri. In "The Leeches of the United States National Museum," Moore (1898) reports two species (one specimen of

each) from the Current River, Shannon County, viz., *Glossiphonia parasitica* and *Dina*, species undetermined.

In the southeastern Missouri region there are four families represented, the Glossiphonidae, Piscicolidae (Ichthyobdellidae*), Hirudinidae, and Herpobdellidae.

LIST OF LEECHES OF SOUTHEASTERN MISSOURI

Helobdella stagnalis (Linnaeus, 1758) Blanchard, 1896.

The writer found this species in shallow warm water attached to the underside of stones, sticks and water plants. Found in Perry, Madison, Wayne, Bollinger, Cape Girardeau, New Madrid, Dunklin, Butler and Pemiscot Counties. It is widely distributed in the United States having been reported from Woods Hole, Massachusetts, west to Arizona and from Lake Okechobee in Florida north to southern Canada.

Helobdella nepheloidea (Graf, 1899) Moore, 1924.

Taken in Scott and Pemiscot Counties. Not abundant. This species is reported from Wisconsin, Massachusetts, Minnesota, Lake Erie and southern Canada.

Glossiphonia fusca Castle, 1900.

In southeastern Missouri this species is found in reasonable abundance. Previously reported from Illinois, Minnesota, Wisconsin, the Great Lakes and southern Canada.

Glossiphonia complanata (Linnaeus, 1758) Johnson, 1816.

This species was found, though not common, in nine of the twelve counties. Reported common in the Great Lakes, adjacent states, and Massachusetts.

Placobdella† montifera Moore, 1912.

The writer found this species in shallow water in swampy areas in all but two counties. Previously it has been reported from Connecticut, west to Wisconsin, and from southern Canada south to Illinois.

Placobdella pediculata Hemingway, 1908.

The writer took this species on drumfish (*Aplodinotus grunniens*) from Whitewater and Apple Creeks in Cape Girardeau County. Not abundant. It has been reported from Minnesota, Wisconsin and Illinois.

Placobdella parasitica (Say, 1824) Moore, 1901.

Abundant in all the counties. It has been reported from New York west to Arizona and from Tennessee north to Canada.

Placobdella rugosa (Verrill, 1874) Moore, 1901.

This species was found to be common in southeastern Missouri,

*The family name Ichthyobdellidae in common usage is not available since the name Ichthyobdella for the type genus is regarded as a synonym of Piscicola.

†In view of the fact that authorities on leeches are divided as to the status of the generic name *Placobdella* R. Blanchard 1893, the present writer has continued to use this currently accepted name without any commitment as to the possible validity of the generic name *Haementeria* de Filippi 1849.

attached to rocks, wood and turtles. Reported from Connecticut west to Colorado, and from Canada south to Illinois.

Placobdella picta (Verrill, 1872) Moore, 1906.

The writer has found this species well distributed in southeastern Missouri, though not abundant. Reported from Georgian Bay, Lake Erie, northeastern Wisconsin and Connecticut.

Piscicola punctata (Verrill, 1871) Moore, 1912.

Taken from the common carp (*Cyprinus carpio*) and the buffalo fish (*Megastomatobus cyprinella*), to which they were attached, from the Mississippi River at Commerce, Scott County. In the literature, this species, generally known as the fish leech, has been reported taken from the following fish: Log perch (*Percina caprodes*), perch (*Perca flavescens*), wall-eyed pike (*Stizostedion vitreum*), small-mouthed black bass (*Micropterus dolomieu*), rock bass (*Ambloplites rupestris*), common carp (*Cyprinus carpio*), buffalo fish (*Megastomatobus cyprinella*), from Ohio, Lake Erie, Lake Superior, Minnesota, Nova Scotia, Wisconsin, Georgian Bay, Lake Nipigon and Illinois.

Haemopis marmoratis (Say, 1824) Moore, 1901.

The writer found this species in a semi-aquatic environment in Scott, Dunklin, Pemiscot, Butler, Mississippi and New Madrid Counties. Reported from New Jersey west to Kansas, and north to southern Canada.

Haemopis lateralis (Say, 1824) Moore, 1901.

Six specimens were collected in Caney Basin northwest of Oran, Scott County, in soil dry enough to be plowed. Earlier reports list this species from Maine west to Colorado and from Tennessee to Lake Superior.

Herpobdella punctata (Leidy, 1870) Moore, 1901.

In southeastern Missouri this species was found in great abundance, in shallow water concealed under stones, leaves, and submerged logs. Previously reported from New York, Wisconsin, Minnesota, the Great Lakes Region and southern Canada.

Dina microstoma Moore, 1901.

This species was found in Madison, Cape Girardeau, Scott, Mississippi, New Madrid, Dunklin, Butler and Pemiscot Counties, in the ooze on submerged logs and sticks. Not common. Reported from Pennsylvania, Ohio and Illinois.

Dina fervida (Verrill, 1871) Moore, 1901.

The writer found this species in great abundance in southeastern Missouri, on submerged stones and wood in shallow water. Previously reported from Ohio, Illinois, Minnesota, southern Canada, Lake Erie and Lake Superior.

This study was completed at the Franz Theodore Stone Laboratory of Ohio State University at Put-in-Bay, Ohio. The writer wishes to acknowledge his indebtedness to Dr.

Raymond C. Osburn, under whose direction this work was done, for his kind assistance, encouragement, and many valuable suggestions. Dr. John A. Miller, of Ohio State University, was kind enough to check the author's identifications.

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Methods in Plant Physiology

This book will prove useful to all botanists engaged in teaching laboratory plant physiology. It is the most comprehensive volume which has yet appeared on the subject in the English language. The first part, entitled "Laboratory Exercises," is essentially a laboratory course in plant physiology. The order of arrangement of the topics does not appear to be a very logical one, but this is a minor matter in a laboratory guide. One hundred and eighty-two experiments are described covering all phases of the subject. The experiments are for the most part well chosen although the reviewer is puzzled by the complete omission of any exercises dealing with modern concepts of the osmotic quantities of plant cells. The experiments are classified according to their difficulty into three groups—elementary, intermediate, and advanced, a useful pedagogical device. There are numerous citations to text books and original literature.

The second part of the book, entitled "General Methods," is essentially a brief discussion of standard chemical and physical methods used in plant physiological research. Chemical methods are more strongly emphasized than physical methods. More extensive bibliographies would, in the opinion of the reviewer, enhance the value of this part of the book. The last chapter in this section, by Snedecor, deals with the statistical methods used in biology. The writer has been informed by competent statisticians that this is an excellent introduction to the principles of this subject.

The appendix consists of thirty-three tables covering most of the physical and chemical constants of frequent use in plant physiological work.—B. S. Meyer.

Methods in Plant Physiology, by W. E. Loomis and C. A. Shull, (with a chapter on Statistical Methods by G. W. Snedecor). New York, McGraw-Hill Book Co. 1937.

INSECT HOSTS AND NYMPHAL DEVELOPMENT OF PODISUS MACULIVENTRIS SAY AND PERILLUS BIOCULATUS F. (HEMIPTERA, PENTATOMIDAE)

B. J. LANDIS,

Bureau of Entomology and Plant Quarantine,
U. S. Department of Agriculture

Two predacious pentatomids found commonly in Ohio, *Podisus maculiventris* Say and *Perillus bioculatus* F., have been observed feeding on various insects and insect stages in the field. It seems probable that many insects are fed upon at times because of the absence of more favorable hosts. Theoretically, a favorable host is one that allows rapid growth and causes little mortality in the predator population supported by it. Presented here are results of attempts to classify a few of the insects fed upon by these two predators, their suitability being measured by the rate of growth and percent of mortality occurring among sets of nymphs reared in the insectary.

Available insects found to be acceptable to nymphs of *Podisus maculiventris* were the Colorado potato beetle (*Leptinotarsa decemlineata* Say), the asparagus beetle (*Crioceris asparagi* L.), the three-lined potato beetle (*Lema trilineata* Oliv.), the Mexican bean beetle (*Epilachna varivestis* Muls.), the fall webworm (*Hyphantria cunea* Dru.), and the diamondback moth (*Plutella maculipennis* Curt.). Nymphs of *Perillus bioculatus* were reared on the Colorado potato beetle, the asparagus beetle, the three-lined potato beetle, the cabbage looper (*Autographa brassicae* Riley), and the spinach flea beetle (*Disonycha xanthomelaena* Dalm.).

The larvae of two species of host insects were reared on a number of cultivated plants and weeds. Sets of larvae of the same species so reared are considered as having been plant-conditioned according to the kind of plant on which feeding occurred. Plant-conditioned larvae of *Leptinotarsa decemlineata* were reared on potato, tomato, eggplant, ornamental tobacco (*Nicotiana affinis*), matrimony vine (*Solanum dulcamara*), bull nettle (*Solanum carolinense*), and an ornamental, *Solanum atropurpureum*. Plant-conditioned larvae of *Lema trilineata* were reared on jimsonweed (*Datura stramonium*), trumpet flower (*Datura cornucopia*), Chinese lantern flower (*Physalis francheti*), and an ornamental, *Solanum arboreum*.

TECHNIQUE

Predator eggs were collected from the field and from pairs of adults confined in the insectary. Nymphs molting from the phytophagous first instar to the carnivorous second instar were placed in separate small shell vials to which a constant type of food was supplied daily. The size and number of individuals of the hosts placed in each vial were increased as the nymphs grew so that there was an excess of easily available food present at all times.

Podisus maculiventris Say

Eggs of at least three species of hosts fed upon in the larval, the pupal, and occasionally the adult stage do not appear to be acceptable food for the nymphs of this predator. Of 24 second-instar nymphs confined with eggs of *Epilachna varivestis*, all but two died within four days and without feeding. One nymph consumed 12 eggs and another 13 eggs and lived 16 and 18 days, respectively, without having molted. Six second-instar nymphs refused to feed on eggs of *Lema trilineata* and all were dead after five days. Four second-instar nymphs fed slightly on eggs of *Leptinotarsa decemlineata* from potato, three dying in molt after six days, and one individual completing development and emerging as an adult after 18 days of feeding on eggs. In another set nine second-instar nymphs fed slightly on eggs of *L. decemlineata* from *Solanum dulcamara*, eight nymphs dying after 11 days and the last after 23 days.

The rate of development of the predator nymphs appear to correspond to the rate of development of the hosts fed upon. The body fluids of host larvae having a short larval period, as does *Plutella maculipennis*, appear to be more nourishing than larvae of *Leptinotarsa decemlineata*, having a much longer larval period. Nymphs reared on larvae of *Plutella maculipennis*, *Crioceris asparagi*, *Lema trilineata*, and *Leptinotarsa decemlineata* completed development in that order (Table I).

The species or stages of hosts causing the most rapid development of the predator nymphs did not produce the greatest number of adult predators. However, where the rate of nymphal development was relatively slow the mortality occurring among the nymphs was extremely high in most cases (Table I).

The rate of development and the mortality of the nymphs occurring in sets reared on plant-conditioned larvae of *Lepti-*

TABLE I

Length of the four predatory instars and the percent of nymphal mortality of *Podisus maculiventris* Say, reared in the insectary on several different host insects and plant-conditioned insects of the same species.

Host Insect	Stage	Host Plant	No. of Nymphs	Length of Instars in Days				Days 2nd Instar to Adults	Percent of Mortality
				2nd	3rd	4th	5th		
Lema trilineata	Larval	*Solanum arboreum*	8	3.7	3.0	4.2	9.0	19.9	14.3
Crioceris asparagi	"	Asparagus	6	2.8	4.3	4.3	7.3	18.7	33.3
Leptinotarsa decemlineata	"	Tomato	6	5.3	4.3	5.0	7.8	22.4	33.3
" "	"	Potato	10	5.0	4.1	4.6	7.3	21.0	50.0
Plutella maculipennis	"	Cabbage	4	3.0	3.5	3.5	6.0	16.0	50.0
Leptinotarsa decemlineata	"	Eggplant	8	4.9	3.7	4.3	6.5	19.4	50.0
Epilachna varivestis	"	Beans	54	*	*	*	*	*	56.6
Leptinotarsa decemlineata	"	*Solanum dulcamara*	33	5.1	4.9	5.1	7.5	22.6	69.7
Lema trilineata	"	*Datura cornucopia*	12	3.3	4.6	4.4	8.0	20.3	75.0
Hyphantria cunea	"	Mulberry	14	*	*	*	*	*	78.6
Leptinotarsa decemlineata	Egg	Potato	9	4.0	3.0	4.0	7.0	18.0	88.9
" "	Larval	*Solanum atropurpureum*	9	4.5	4.0	4.5	7.0	20.0	88.9
" "	"	*Solanum carolinense*	28	5.9	5.3	5.8	7.0	24.0	89.3

* Sets of nymphs not run at comparable temperature.

notarsa decemlineata are apparently affected in some instances by toxic substances obtained indirectly from the host plants. Nymphs reared on larvae which fed on *Solanum carolinense* developed more slowly (24 days) and greater numbers died (89.3 percent) than was the case among sets of nymphs reared on other plant-conditioned larvae of the same species (Table I). *Solanum atropurpureum* was extremely toxic to nymphs of *Podisus maculiventris*, but was much less so to nymphs of *Perillus bioculatus* (Table III). Nymphs of *Podisus maculiventris* developed slowly on larvae reared on *Solanum dulcamara* and the nymphal mortality was slightly higher than among sets of nymphs reared on larvae from potato, tomato, and eggplant.

Perillus bioculatus F.

The eggs of *Leptinotarsa decemlineata* constitute a large part of the food of *Perillus bioculatus* when these are available. Twenty-one nymphs reared in the insectary consumed an average of 231.5 eggs during the four predacious instars (Table II).

Eggs of *Lema trilineata* are fed upon in the field but the small size of the eggs and the few individuals to the mass make them of little value in nymphal development. Seven nymphs reared in the insectary on eggs developed more slowly and the adult bugs were much smaller than comparable nymphs reared on larvae of *Lema trilineata*. The average number of eggs consumed during the four predacious instars was 451.7 eggs (Table III).

Nymphs of *Perillus bioculatus* developed more rapidly and there was less mortality when they were reared on larvae of *Lema trilineata* or *Crioceris asparagi* than on larvae of *Leptinotarsa decemlineata* (Table IV). On host-conditioned larvae of *Leptinotarsa decemlineata* the development of the nymphs was most rapid when feeding occurred on larvae reared on *Solanum dulcamara*, and most prolonged on larvae reared on *Solanum carolinense*. As was the case with *Podisus maculiventris*, the greatest amount of nymphal mortality of *Perillus bioculatus* occurred among nymphs feeding on larvae from *Solanum carolinense*.

TABLE II

Length of the four predatory instars of *Perillus bioculatus* and the number of eggs of *Leptinotarsa decemlineata* eaten in the insectary

Nymph No.	Days in 2nd Instar	Eggs Eaten	Days in 3rd Instar	Eggs Eaten	Days in 4th Instar	Eggs Eaten	Days in 5th Instar	Eggs Eaten	Total		
									Days of Development	Eggs Eaten	Sex of Predator
1	3	7	4	18	3	42	6	101	17	168	Female
2	2	9	3	19	4	38	7	137	18	203	Male
3	2	9	3	20	3	36	6	108	16	173	"
4	3	6	2	21	4	48	6	127	17	202	.....
5	2	7	3	25	3	35	7	137	18	204	Male
6	2	5	4	25	6	23	7	117	18	170	Female
7	3	7	2	20	3	35	7	133	18	195	"
8	2	5	3	17	3	29	6	98	16	149	Male
9	2	5	4	27	3	40	7	129	18	201	Female
10	2	6	3	34	3	46	6	108	16	194	"
11	2	11	4	19	3	21	6	108	18	159	Male
12	3	9	2	13	3	62	7	192	17	276	"
13	3	7	2	12	3	51	7	208	17	278	"
14	3	7	3	23	2	35	7	182	17	247	"
15	3	7	3	27	2	35	7	253	17	322	Female
16	3	9	2	9	3	56	7	218	17	292	Male
17	3	10	5	24	2	45	8	189	18	268	"
18	4	9	3	34	3	51	7	213	19	307	"
19	3	8	3	22	2	47	7	208	17	285	"
20	4	8	3	15	5	69	6	159	21	251	"
21	3	8	3	16	2	41	7	253	17	318	Female
Average	2.7	7.6	3.0	21.0	3.1	42.1	6.7	160.9	17.5	231.5	

TABLE III

Length of the four predatory instars of *Perillus bioculatus* and the number of eggs of *Lema trilineata* eaten in the insectary

Nymph No.	Days in 2nd Instar	Eggs Eaten	Days in 3rd Instar	Eggs Eaten	Days in 4th Instar	Eggs Eaten	Days in 5th Instar	Eggs Eaten	Total	
									Days of Develop-ment	Eggs Eaten
1.....	3	15	4	67	7	129	12	301	26	512
2.....	3	29	5	52	7	115	13	225	28	421
3.....	4	38	5	42	6	163	14	170	29	413
4.....	4	19	5	60	8	166	13	254	30	499
5.....	4	18	4	48	7	152	11	348	26	566
6.....	4	19	4	38	7	145	12	188	27	390
7.....	5	21	5	50	7	176	15	107	32	361
Average.....	3.9	22.7	4.6	51.0	7.0	149.4	12.9	227.6	28.3	451.7

TABLE IV

Length of the four predatory instars and the percent of nymphal mortality of *Perillus bioculatus* Fabr., reared in the insectary on several different host insects and plant-conditioned insects of the same species.

Host Insect	Stage	Host Plant	No. of Nymphs	Length of Instars in Days				Days 2nd Instar to Adult	Percent of Mortality
				2nd	3rd	4th	5th		
Leptinotarsa decemlineata	Egg	Potato	13	2.9	3.7	3.7	5.3	15.6	30.8
Lema trilineata	Larval	*Datura stramonium*	23	3.7	3.8	3.8	5.8	17.1	34.8
" "	"	*Physalis francheti*	22	4.3	3.1	3.4	6.3	17.1	36.4
Crioceris asparagi	"	Asparagus	19	3.0	4.3	4.0	6.0	17.3	36.8
Lema trilineata	"	*Datura cornucopia*	8	3.5	4.2	4.2	6.2	18.1	37.5
Disonycha xanthomelaena	"	Spinach, beet	7	*	*	*	*	*	42.9
Lema trilineata	"	*Solanum arboreum*	8	4.0	4.7	4.3	6.3	19.3	50.0
Leptinotarsa decemlineata	"	*Solanum atropurpureum*	6	6.0	5.5	4.3	7.0	22.8	50.0
" "	"	*Nicotiana affinis*	23	6.3	4.3	5.6	6.5	22.7	56.5
Lema trilineata	Egg	*Datura stramonium*	18	*	*	*	*	*	61.1
Leptinotarsa decemlineata	Larval	Potato	11	4.2	4.4	3.8	6.5	18.9	63.8
" "	"	Tomato	31	4.1	4.3	4.1	6.9	19.4	67.7
Autographa brassicae	"	Cabbage	10	*	*	*	*	*	70.0
Leptinotarsa decemlineata	*	*Solanum dulcamara*	35	3.5	3.5	4.6	6.8	18.4	74.3
" "	"	Eggplant	28	5.3	5.1	3.8	7.0	21.2	78.6
" "	"	*Solanum carolinense*	22	5.3	4.1	5.3	8.0	22.7	90.9

* Sets of nymphs not run at comparable temperature.

SUMMARY AND CONCLUSIONS

The rate of development and the amount of mortality among sets of nymphs of *Podisus maculiventris* and *Perillus bioculatus* reared on several hosts and under comparable conditions in the insectary appeared to depend upon the kind of food taken. Insect eggs, when acceptable, were most nourishing and were followed in the order of their value by larvae of hosts, depending upon their metabolic rate. Furthermore, hosts of the same species, but reared on different food plants, caused considerable variation in the rate of development and the relative mortality of the predator nymphs. Nymphs died more rapidly when the rate of development was slow. It appears that certain substances transmitted from the plant through the host to the predator caused large numbers of nymphs to die, yet in some cases did not affect the rate of development of those that survived.

Physiology

In achieving certain aims set forth in his preface, Dr. Wiggers has succeeded admirably in illustrating physiological principles by reference to clinical examples, and its converse, the analysis of many clinical conditions on the basis of established experimental observations—an end which is not given every writer to attain. The volume is comprised of ten sections, beginning with the phenomena of muscular contraction and considering, in order, the physiology of the nervous system, blood, respiration, heart and circulation, alimentary tract, water transport, metabolism, endocrine organs and, finally, reproduction. Of these sections, that on the heart and circulation constitutes, in the reviewer's opinion, one of the most splendid ever written. It is gratifying to note the amount of space allotted to the endocrine organs and to reproduction. Here as elsewhere Dr. Wiggers has exercised skillful perspective, particularly with regard to the more controversial points. The bibliographies are well chosen and each chapter is appropriately annotated with leading references. If any adverse criticism were to be advanced it would concern a somewhat ponderous style which appears from time to time in subject matter where it is felt that greater clarity would have been highly desirable. However, the wealth of wisely considered and excellently organized material which comprises this volume more than compensates for what is perhaps a dubious criticism at best.—H. HATERIUS.

Physiology in Health and Disease, by Carl J. Wiggers; 1124 pp., 2d. Ed. Philadelphia, Lea and Febiger, 1937. $9.00.

ADDITIONS TO THE REVISED CATALOG OF OHIO VASCULAR PLANTS, V.[1]

JOHN H. SCHAFFNER

Since the last report on the additions to the Ohio State Herbarium, a great improvement has been made in the storing of both the Ohio plants and the collections of the General Herbarium. New steel cases have been obtained and it thus became possible to arrange the general collection in cases again. Most of this collection had been packed away in boxes ever since the Botany Department moved into the new Botany-Zoology building in the autumn of 1914, because there was no money available to buy herbarium cases.

During the past year several thousand specimens have again been mounted through the help of six students working under N. Y. A. The collection of mosses has been greatly improved and enlarged under the supervision of Mr. Richard T. Wareham, and a large number of specimens have also been added to the general fern collection. Our enthusiastic amateur botanists have contributed their usual large number of specimens. The rare ones and those which give important extensions of geographical range in the state are listed below together with their localities and the collector's names. Species and varieties new to the state list number 19 of which 6 are escapes from cultivation or accidental and 13 indigenous or of unknown origin. Some of the new records extend the known distribution range very decidedly, and raise puzzling questions as to how the plants came to be in the places where they are now growing. Apparently the most interesting of these is *Scirpus saximontanus* Fern. Collected by Bartley and Pontius in Pickaway County, heretofore not known east of the Black Hills and central Nebraska. *Echinodoris cordifolius* (L.) Griseb. and its variety *lanceolatus* (Engelm.) Mack & Bush, from Ross and Pickaway Counties respectively, are also far east of their supposed natural range. A card index showing distribution by counties of each species, represented in the State Herbarium, is being prepared and when all of the present 50,000 specimens have been mapped, the study of the geographic distribution of our Ohio plants will be great facilitated.

10.1. *Lygodium palmatum* (Bern.) Sw. Climbing fern. Isaak Walton League Farm, Waterloo Twp., Athens Co. About 5-6 miles from the Carbondale record. Walter P. Porter and P. S. Wamsley.

19. *Pellaea glabella* Mett. Northern Purple Cliff-brake. Sidney, Shelby Co. Joseph A. Clem.

42a. *Polystichum acrostichoides schweinitzii* (Beck.) Small. Berne Twp., Fairfield Co.; Laurel Twp., Hocking Co. Chas. R. Goslin.

46. *Woodsia obtusa* (Spreng.) Torr. Blunt-lobed Woodsia. Sidney, Shelby Co. Joseph A. Clem.

50. *Azolla caroliniana* Willd. Carolina Azolla. Little Cedar Point Marsh east of Toledo, Lucas Co. John J. Lynch.

55. *Equisetum kansanum* Schaffn. Kansas Scouring-rush. Deer Creek Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius. Three miles north of Clifton, in Clark Co. John H. Schaffner.

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[1]Papers from the Department of Botany, The Ohio State University, No. 390.

71.1. *Abies balsamea* (L.) Mill. Balsam Fir. Escaped into Mitchells Mills Bog, Chardon Twp., Geauga Co. John W. Aldrich.

81.1. *Echinodorus cordifolius* (L.) Griseb. Upright Burhead. Liberty Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.

81.1a. *Echinodorus cordifolius lanceolatus* (Engelm.) Mack & Bush. Circleville Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.

82. *Lophotocarpus calcyinus* (Engelm.) J. G. Smith. Large Lophotocarpus. Ross Co. Floyd Bartley and Leslie L. Pontius.

84. *Sagittaria cuneata* Sheldon. Arum-leaf Arrow-head. High banks along Deer Creek. Deer Creek Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.

87.1. *Butomus umbellatus* L. Flowering-rush. Hatchery Bay, South Bass Island, Ottawa Co. L. H. Tiffany.

98. *Potamogeton epihydrus* Raf. Nuttall's Pondweed. Solon Bog. Portage Co. J. W. Aldrich.

101.1. *Potamogeton crispus* L. Curly Pondweed. Russell Twp., Geauga Co. Vernon Gifford.

115. *Nelumbo lutea* (Willd.) Pers. American Water-lotus. Liberty Twp., Ross Co. Leslie L. Pontius and Floyd Bartley.

144.1. *Scirpus georgianus* Harper. Georgia Bulrush. Rock Run, Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.

145.2. *Scirpus occidentalis* (Wats.) Chase. Viscid Great Bulrush. Toussaint Marsh, Carroll, Ottawa Co. John J. Lynch.

150.1. *Scirpus saximontanus* Fern. George Hitler's pond, Circleville Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius. Specimen determined by M. L. Fernald.

156. *Eleocharis mutata* (L.) R. & S. Four-angled Spike-rush. Liberty Twp. Jackson Co. Floyd Bartley and Leslie L. Pontius.

167. *Dulichium arundinaceum* (L.) Britt. Dulichium. Buckeye Creek, Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.

174. *Cyperus inflexus* Muhl. Awned Cyperus. Pickaway Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.

226. *Carex incomperta* Bickn. Prickly Bog Sedge. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

259. *Carex pedunculata* Muhl. Long-stalked Sedge. White's Gulch, Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

261. *Carex eburnea* Boott. Bristle-leaf Sedge. Dry limestone cliff. Brush Twp., Highland Co. Floyd Bartley and Leslie L. Pontius.

284. *Carex gracillima* Schw. Graceful Sedge. Cedar Swamp, Champaign Co. R. B. Gordon.

287. *Carex flexuosa* Muhl. Slender-stained Sedge. Washington Twp., Pickaway Co. Leslie L. Pontius and Floyd Bartley.

293. *Carex scabrata* Schw. Rough Sedge. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

320. *Carex intumescens* Rudge. Bladder Sedge, Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

333.1. Change name to *Bromus latiglumis* (Shear) Hitchc., and add, Huntington Twp., Gallia Co. Clyde H. Jones.

337. *Melica nitens* Nutt. Tall melic-grass. Highland Co. Floyd Bartley and Leslie L. Pontius.

353. *Uniola latifolia* Mx. Broad-leaf Spike-grass. Huntington Twp., Gallia Co. Clyde H. Jones.

369. *Eragrostis poaeoides* (L.) Beauv. Low Love-grass, Liberty Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.

371. *Eragrostis pilosa* (L.) Beauv. Tufted Love-grass. Common in sidewalks between bricks. Columbus, Franklin Co. John H. Schaffner.

386. *Trisetum pennsylvanicum* (L.) Beauv. Marsh False-oats. In a bog, Whites Gulch, Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.

444a. *Elymus virginicus submuticus* Hook. Empty glumes and lemmas awnless or nearly so. Pickaway Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.

457. *Atheropogon curtipendulus* (Mx.) Fourn. Tall Grama-grass. Apparently native, covering a hillside 1 mile southeast of New Moorefield, Clark Co. E. N. Transeau.

483. *Panicum polyanthes* Schultes. Many-flowered Panic-grass. Nile Twp., Scioto Co. F. B. Chapman.
505.2. *Paspalum pubiflorum glabrum* Vasey. Smooth-glumed Paspalum. Liberty Twp., Jackson Co. and Washington Twp., Pickaway Co. Leslie L. Pontius and Floyd Bartley.
508. *Paspalum setaceum* Mx. Slender Paspalum. Section 20, Hanover Twp., Butler Co. E. E. Good. Berne Twp., Fairfield Co. Chas. R. Goslin.
516. *Sorghastrum nutans* (L.) Nash. Indian-grass. Section 11, Reily Twp., Butler Co. E. E. Good.
526. *Lilium superbum* L. Turk's-cap Lily. Common in a field in Knox Co. Katie M. Roads.
586. *Heteranthera dubia* (Jacq.) MacM. Water-stargrass. Davenport Pond, Pickaway Co. Leslie L. Pontius and Floyd Bartley.
629. *Iris foliosa* Mack. & Bush. Leafy Blue-flag. Salt Creek Twp., Pickaway Co. Ruth Frances Morris.
631. *Iris germanica* L. Common Iris. Escaped along road. Cedarville Twp., Greene Co. John H. Schaffner.
659. *Ibidium beckii* (Lindl.) House. Little Lady's-tresses. Near Clover Hill Bog, N. Bloomfield Twp., Trumbull Co. R E. Shanks.
675. *Hexalectris spicata* (Nutt.) Barnh. Crested Coral-root. Nile Twp., Scioto Co. F. B. Chapman.
700. *Helleborus viridis* L. Green Hellebore. Hocking Twp., Fairfield Co. Chas. R. Goslin.
707. *Delphinium exaltatum* Ait. Tall Larkspur. Deer Creek Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.
727. *Thalcitrum revoltum* DC. Waxy Meadow-rue. Friendship, Scioto Co. Julius B. Katz, F. B. Chapman, and R. B. Gordon.
764. *Alyssum alyssoides* L. Yellow Alyssum. Along interurban R. R. track. Urbana Twp., Champaign Co. John H. Schaffner.
774. *Neobeckia aquatica* (Eat.) Britt. Lake Water-cress. Pickaway Twp., Pickaway Co. Leslie L. Pontius and Floyd Bartley.
793. *Cheirinia insconspicua* (Wats.) Britt. Prairie Cheirinia. long interurban R. R. track. Urbana Twp., Champaign Co. John H. Schaffner.
843. *Polanisia graveolens* Raf. Clammy-weed. Many plants in waste ground. Columbus, Franklin Co. John H. Schaffner. Fairport Harbor, Lake Co. Very common. F. J. Tyler. Coshocton Co. Frank B. Selby.
860. *Oxalis rufa* Small. Red-leaf Wood-sorrel. Mesopotamia Twp., Trumbull Co. R. E. Shanks.
943. *Hypericum boreale* (Britt.) Bickn. Northern St. John's-wort. Odell Sanctuary, Nile Twp., Scioto Co. Floyd B. Chapman.
960. *Lechea leggettii* Britt. & Holl. Leggett's Pinweed. Braceville Ledge, Trumbull Co. A. N. Rood and R. E. Shanks.
966. *Viola hastata* Mx. Halberd-leaf Yellow Violet. Johnston Twp., Trumbull Co. R. E. Shanks.
987. *Viola fimbriatula* Sm. Ovate-leaf Violet. Vincent, Washington Co. C. F. Walker and J. W. Sites.
1006. *Cerastium viscosum* L. Mouse-ear Chickweed. In a vacant lot. Hillsboro, Highland Co. Katie M. Roads.
1088. *Trientalis americana* (Pers.) Pursh. Star-flower. Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.
1103. *Pleuropterus zuccarinii* Small. Japanese Knotweed. "A large colony on railroad right of way." Blissfield, Coshocton Co. Frank B. Selby.
1139. *Potentilla pumila* Poir. Dwarf Five-finger. Henley, Scioto Co. Katie M. Roads.
1143. *Drymocallis agrimonioides* (Pursh) Rydb. Tall Cinquefoil. Colerain Twp., Ross Co. Floyd Bartley and Leslie L. Pontius.
1152. *Rubus neglectus* Peck. Purple Raspberry. S. W. Bloomfield, Trumbull Co. R. E. Shanks.
1167. *Spiraea prunifolia* Sieb. & Zucc. Bridal-wreath (Spiraea). In a pasture lot. North-western Adams Co. Katie M. Roads.
1178.2. *Rosa foetida persiana* Rehd. Persian Yellow Rose. From western Asia. Along the road, Jackson Twp., Highland Co. Katie M. Roads.
1188. *Prunus mahaleb* L. Mahaleb Cherry. Reily Twp., Butler Co. E. E. Good.

1189. *Prunus pennsylvanica* L. f. • Red Cherry. Thompson's Ledge, Geauga Co. F. J. Tyler.

1228. *Crataegus phaenopyrum* (L. f.) Medic. Washington Hawthorn. Section 8, Reily Twp., Butler Co. E. E. Good.

1254. *Trifolium reflexum* L. Buffalo Clover. In dry woods. Liberty Twp. Jackson Co. Floyd Bartley and Leslie L. Pontius.

1264. *Robinia hispida* L. Rose Acacia. Jackson Twp. Jackson Co. Floyd Bartley and Leslie L. Pontius.

1282. *Meibomia marylandica* (L.) Ktz. Maryland Tick-trefoil. Friendship, Scioto Co. R. B. Gordon, J. S. Katz, and F. B. Chapman. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

1300. *Vicia cracca* L. Remove Lake and Franklin Cos. from distribution list and add Ashtabula.

1300.1. *Vicia dasycarpa* Ten. (*V. varia* Host.). Variegated Vetch. From Europe. Painesville, Lake Co. Coll., Otto Hacker in 1900. Columbus, Franklin Co. Coll., John Wolfe in 1931. Determined by N. C. Fassett.

1307. *Vicia angustifolia* L. Narrow-leaf Vetch. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

1314. *Lathyrus latifolius* L. Everlasting Pea. Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius.

1316. *Clitoria mariana* L. Butterfly-pea. White's Gulch, Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

1321. *Galacta volubilis* (L.) Britt. Downy Milk-pea. Nile Twp., Scioto Co. F. B. Chapman.

1322. *Phaseolus polystachyus* (L.) B. S. P. Wild Bean. Rock Run, Liberty Twp., Jackson Co. Floyd Bartley and Leslie L. Pontius. North Madison, Lake Co. Harry Crofoot.

1344. *Rotala ramosior* (L.) Koehne. Rotala. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

1347. *Lythrum salicaria* L. Spiked Loosestrife. On old prairie, three miles west of Marion, Marion Co. E. N. Transeau.

1352. *Rhamnus caroliniana* Walt. Carolina Buckthorn. Hobey Hollow, Nile Twp., Scioto Co. F. B. Chapman.

1359.1. *Vitis labruscana* Bail. Labruscan Vineyard Grape. In a sand dune near the lake beach. Ashtabula Co. Harry Crofoot and F. J. Tyler.

1421. Change name to *Quercus montana* Willd. Rock Chestnut Oak. *Q. prinus* L. is the true name of the Cow Oak not known to occur in Ohio.

1431.1. *Quercus borealis* Mx. f. Gray Oak. In recognizing this form of the red oak group, we have definite specimens from Perry and Madison, Lake Co., F. J. Tyler; along Black River, Lorain Co., F. O. Grover; Liberty Twp., Jackson Co., Floyd Bartley and Leslie L. Pontius; Friendship, Scioto Co., Delzie Demaree.

1432. Change name to *Quercus maxima* (Marsh.) Ashe. Common Red Oak. *Q. rubra* L. is the true name of the Spanish Red Oak, *Q. triloba* Mx.; thus No. 1429 becomes *Quercus rubra* L.

1519. *Circaea alpina* L. Small Enchanter's-nightshade. Liberty Twp., Jackson Co. Leslie L. Pontius and Floyd Bartley.

1525.1. *Cucurbita foetidissima* H. B. K. (*Pepo foetidissima* (H. B. K.) Britt. Wild Pumpkin. Accidental along R. R., growing for at least three years. From the west. Columbus, Franklin Co. Wendell Paddock.

1553. *Chimaphila umbellata* (L.) Nutt. Pipsissewa. N. W. Mesopotamia Twp., Trumbull Co. R. E. Shanks.

1655. *Gonolobus laevis* Mx. Sandvine. Along Tuscarawas River, Coshocton Co. Frank B. Selby.

1656. *Cynachium nigrum* (L.) Pers. Black Swallow-wort. Lake Co. Harry Crofoot.

1672. *Physalis pubescens* L. Low Hairy Ground-cherry. In a pasture lot. May Hill, Adams Co. Katie M. Roads.

1705.1. *Digitalis lanata* Ehrh. Woolly Foxglove. Near Circleville, Pickaway Co. Escaped from cultivation. From Europe. Ethel L. Boyer.

1729. *Veronica polita* Fries. Procumbent Speedwell. Athens, Athens Co. Walter P. Porter.

1751. *Thalesia uniflora* (L.) Britt. Naked Broom-rape. Sharon Twp., Franklin Co. John Wolfe and S. S. Humphrey.

1779.1. *Myosotis versicolor* (Pers.) J. E. Smith: Yellow-and-blue Forget-me-not. Kelley's Island, Erie Co. E. L. Moseley.
1816. *Mentha rotundifolia* (L.) Huds. Roundleaf Mint. Farmer's Station, Clinton Co. Katie M. Roads.
1909. *Thaspium pinnatifidum* (Buckl.) Gr. Cutleaf Meadow-parsnip. Chuckery, Madison Co. L. E. Hicks and E. S. Thomas.
1942. *Cynoxylon canadense* (L.) Dwarf Dogwood. Peat soil, swamp forest. South Bog, Burton, Geauga Co. J. W. Aldrich.
1968. *Sherardia arvensis* L. Blue Field-madder. Hirtland Hills, Lake Co. H. C. Beardslee and F. J. Tyler.
1978. *Viburnum molle* Mx. Soft-leaf Arrow-wood. Sect. 22, Reily Twp., Butler Co. E. E. Good.
2023.1. *Xanthium speciosum* Kearney. Great Cocklebur. Pickaway Twp., Pickaway Co. Floyd Bartley and Leslie L. Pontius.
2031.2. *Galinsoga ciliata* (Raf.) Blake. Ciliate Galinsoga. Specimens in the herbarium from Lake, Cuyahoga, Lorain, Erie, Columbiana, Jefferson, Belmont, Monroe, Athens, Meigs, Licking, Franklin, Montgomery, Highland, Scioto.
2032. *Galinsoga parviflora* Cav. Small-flowered Galinsoga. After segregating the two species recognized at present for our region, the only specimen in the state herbarium of this species is from Lake Co. Collected by Otto Hacker in 1902.
2050. *Helianthus instabilis* Wats. Unstable Sunflower. Richmond, north of Painesville, Lake Co. F. J. Tyler.
2078. *Bidens discoidea* (T. & G.) Britt. Small Beggar-ticks. Bradley Everett Bog, Burton, Geauga Co. John W. Aldrich.
2089. *Chrysogonum virginianum* L. Chrysogonum. In open oak-hickory woods, Dunham Twp., Washington Co. C. F. Walker and J. W. Sites.
2101.1. *Tagetes patula* L. French Marigold. Spontaneous in waste ground, north Columbus, Franklin Co. Cultivated from Mexico. John H. Schaffner.
2110. *Anaphalis margaritacea* (L.) Benth. & Hook. Pearly Everlasting, Madison, Lake Co. Harry Crofoot and F. J. Tyler.
2121. *Solidago hispida* Muhl. Hairy Goldenrod. Laurel Twp., Hocking Co. Chas. R. Goslin.
2148. *Aster schreberi* Nees. Schreber's Aster. Nile Twp., Scioto Co. F. B. Chapman.
2159. *Aster oblongifolius* Nutt. Aromatic Aster, Marshall Twp., Highland Co. Katie M. Roads.
2165. *Aster concinnus* Willd. Narrow-leaf Smooth Aster. Friendship, Scioto Co. R. B. Gordon, J. S. Katz, and F. B. Chapman.
2169. *Aster vimineus* Lam. Bloomfield Twp., Trumbull Co. R. E. Shanks.
2172. *Aster salicifolius* Lam. Willow Aster. Perry, Lake Co. F. J. Tyler.
2189.1. *Eupatorium album* L. White Thoroughwort. Nile Twp., Scioto Co. F. B. Chapman.

In 1931, just before publication of the Revised Catalog of Ohio Vascular Plants, Dr. M. L. Fernold, of the Gray Herbarium, studied our entire collection of Potamogeton, but because his general report had not been published when the Revised Catalog was placed in the hands of the printer a number of his conclusions could not be included. In July, 1932, Fernald published his monograph of "The Linear-Leaved North American Species of Potamogeton, Section Axillares." in Mem. Gray Herb. Harvard Univ. **3** : 1–183. Below is given a revision of some of the Ohio Potamogetons, agreeing with Fernald's determinations:

98. *Potamogeton epihydrus* Raf. Ashtabula, Trumbull, Medina, Jackson.
98a. *Potamogeton epihydrus nuttallii* (C. & S.). Fern. Doner's Lake, Wayne Co. A. D. Selby.
102. *Potamogeton foliosus* Raf. Leafy Pondweed. Ashtabula, Medina, Lorain, Erie, Auglaize, Champaign, Miami, Montgomery, Hamilton, Scioto, Jackson, Pickaway.

102a. *Potamogeton foliosus macellus.* Fern. Summit, Cuyahoga, Erie, Williams, Logan, Champaign, Licking, Fairfield.
103. Change name to *Potamogeton zosteriformis* Fern.
104. *Potamogeton hillii* Mor. Hill's Pondweed. Ottawa (Mosely Herb.), Portage (Webb Herb.).
104.1. *Potamogeton panormitanus* Biv. Auglaize, Ottawa (U. S. Natl. Herb.), Erie, Summit.
104.2. *Potamogeton strictifolius* Ar. Benn. Stiff-leaf Pondweed. Ottawa (U. S. Natl. Herb.).
105. *Potamogeton friesii* Rupr. Fries' Pondweed. Erie (Moseley and Deam Herbaria), Ottawa (U. S. Natl. Herb.).
107. *Potamogeton pusillus* L. Small Pondweed. Franklin, Ottawa (U. S. Natl. Herb.), Ashtabula.

An Outline of Atomic Spectra

Physical science is a field of shifting interests. Ten years ago the attention of a majority of physicists was fastened on the problems connected with the outer structure of the atom. The solutions to these problems were found by the study of x-rays and line spectra. We have since entered another era in which attention is being directed at the atomic nucleus. This leaves the spectroscopists to themselves to consider more carefully their child, now out of the growing-pains age.

It is surprising that more books on spectroscopy have not been written. Condon and Shortley have written an adequate treatise intended for those who already have a thorough knowledge of the subject. White has written a complicated compendium on the subject. Herzberg, in the book which is the subject of this review, has written an outline. All three books fail to meet the most urgent need of young men entering research in those fields of physics which require a knowledge of spectroscopy.

A careful examination of Herzberg's book convinces the reviewer that it cannot by itself give the student a feeling for the subject. This is primarily the result of the fact that the author has reduced his description of the physical phenomena to a minimum, concentrating his attention on their interpretations. In a condensed outline such as this, the result is a heavy super-structure on an inadequate foundation.

The criticism that must be made of this book is that it misses the greatest need. It is, in fact, a splendid outline clearly written and well organized.

—C. E. Hesthal.

Atomic Spectra and Atomic Structure, by Gerhard Herzberg. xiv+257 pp. New York, Prentice-Hall, Inc., 1937. $4.25.

The Theory of Metals by A. H. Wilson is a book setting forth a rather critical survey of this field of ever increasing importance. The first chapter devotes itself to an historical introduction to the subject giving a brief review of the classical theories of Drude and Lorentz and the first quantum mechanical attempts at solving the problem by Sommerfeld. The second chapter introduces the idea of the Hartree "self consistent field" and the Foch modification to include exchange forces, but concentrates itself especially about the theory concerning the motion of electrons in a perfect lattice. In subsequent chapters these ideas are made use of in discussion of such problems as the optical properties, the conductivity, the resistance and the super-conductivity of metals. Two appendices are devoted to a brief discussion of the Fermi-Dirac statistics and to a sketch of surface phenomena.

This book presents the theory of metals in such a readable and consolidated form that it is to be regarded as a most useful source for the student of physics from which to acquaint himself with this rapidly increasing field.—H. H. Nielsen.

The Theory of Metals, by A. H. Wilson. 271 pp. Cambridge University Press, New York, the Macmillan Co. 1936. $5.00.

TWO NEW SPECIES OF OSBORNELLUS

DWIGHT M. DELONG AND LAWRENCE BEERY,
The Ohio State University, Columbus, Ohio

Osbornellus filamenta n. sp.

Resembling *consors* in general appearance, but darker; slightly smaller and with genitalia quite similar to *borealis*. Length, male, 4.2 mm.; female, 4.5 mm.

Vertex not as sharply angled as in *consors*, as long as basal width between eyes.

Color: Similar to *consors* but much darker. Vertex dark with black markings. Pronotum and scutellum finely mottled dark gray and brown. Elytra clear, veins dark brown. Costal anteapical veinlets and inner ends of claval veins, broadly brown. Central area of cells on disc and second and anteapical cells with elongate brown spots.

Genitalia: In general quite similar to *borealis*. Male plates narrowed to form slender attenuate tips. Styles broad at base, gradually narrowing to slender caudally directed apical portion. Oedagus composed of a rather short dorsal portion below which is a long filamentous, caudally directed process and below this a pair of long, tapered filamentous processes, which are directed caudally. Apices of processes differing distinctly from those of *borealis*, which are angled ventrally and abruptly narrowed at apex.

Described from one male collected at Davis Mts., Texas, Aug. 22, 1936, and one female from the same place, July 6, 1936, by J. N. Knull. Holotype male and allotype female in collection of senior author.

Osbornellus knulli n. sp.

Resembling *consors* in size and general appearance. Genitalia very distinct. Length, 5.5–6 mm.

Vertex about as long as basal width between the eyes.

Color: Similar to *consors* but lacking the distinct markings of vertex and pronotum. Vertex pale with black line along apex, posterior margin white. Pronotum grayish with black markings on anterior margin. Elytra subhyaline, veins brown. Inner ends of claval veins and costal anteapical veinlets, broadly dark brown. Central area of cells on disc and on second and third anteapicals, brown.

Genitalia: Male plates narrowed to form attenuate apical half which is slightly broadened before slender apices. Styles broad at base, narrowing to slender caudally directed apical half. Oedagus composed of a dorsal portion and a pair of broad ventral processes which in ventral view are abruptly narrowed to apices sharply pointed on inner margin. The dorsal process is curved anteriorly on the basal half, and caudally on the apical half which is composed of a short dorsal spur and a much longer, broader, caudally directed process upturned and pointed at apex.

Described from two males and one female, all taken in Huachuca Mts., Ariz., July 20, 1936, J. N. Knull. Holotype male, allotype female and male paratype in collection of senior author.